

ASSET MAPPING AND SUSTAINABLE DEVELOPMENT IN NORTHEASTERN  
NORTH CAROLINA

by

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## **Executive Summary**

Northeastern North Carolina possesses an incredible amount of assets that residents rely on to live and work every day. However, economic stagnation grips the region, suggesting that many of these assets are not being fully employed. The 21 county region lags behind other places in North Carolina in several key indicators, including income, educational achievement, and health outcomes. Threats associated with climate change stand to aggravate these problems and place the assets of northeastern North Carolina at risk.

To address these issues, the Resourceful Communities Program of The Conservation Fund supports sustainable development projects that use the “Triple Bottom Line” approach, which integrates economic development, environmental stewardship, and social justice. Projects that leverage existing assets in the region are particularly useful because they require less external support and provide a sense of ownership to community members.

This project seeks to facilitate asset-based sustainable development in northeastern North Carolina by providing three web-based tools that provide information and inspiration. The three tools identify existing assets in the region, highlight case studies of successful sustainable development in other regions, and provide an organizational framework for evaluating projects in terms of economic, social, and environmental measures. In addition, each tool encourages communities to consider how current and future development projects may be vulnerable to climate change.

The first tool is a broad-based inventory and web-map of community assets based on community workshops led by The Conservation Fund in 2010. It can help to examine the assets systematically and to provide a guide for further work. We synthesized the assets identified by participants of The Conservation Fund’s mapping exercises, as well as assets identified by existing research to create an inventory of 529 unique assets. A 1-meter sea level rise projection is also visualized on the web-map so that users can easily determine possible exposure to inundation.

The second tool is a database of 36 successful sustainable development case studies from around the United States that were suitable for the study area because of shared characteristics between regions. Each case study used similar assets to those available in northeastern North Carolina, was in a rural location, and was related to one of seven promising “green sectors” identified by Elizabeth City State University’s Green Report. The database serves as inspiration for projects that communities might develop in the future.

The third tool is a multi-criteria analysis assessment tool that incorporates local stakeholders’ values obtained from web-based surveys and publicly available documents produced by regional organizations. Within three generalized objectives of the Triple Bottom Line Approach (economic, social, and environmental benefit), we created a lower level of sub-objectives to reflect both stated and interpreted interests of community members in the study area. The complete assessment tool includes 32 unique sub-objectives and related criteria. Three of these sub-objectives address the major climate threats to northeastern North Carolina: sea level rise, increasing major storm activity, and changing temperature and precipitation patterns. We applied our assessment tool to three different case studies for which we had detailed information from our database of successful sustainable development cases.

The inventory of assets, database of case studies, and assessment tool form a suite of products that communities in northeastern North Carolina can use to pursue place-based sustainable development in their region. They are made available to all members of the public at the following website, which is freely accessible at the time of writing: <http://arcg.is/1zUaLXL>. Questions regarding the website should be directed at the staff of The Resourceful Communities Program, available for contact here: <http://www.conservationfund.org/what-we-do/resourceful-communities/our-experts>.

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## Introduction

Northeastern North Carolina possesses an incredible amount of assets that residents rely on to live and work every day. Extensive land and water area, historical and natural landmarks, diverse and skillful people, and a deep sense of rural community character stand out among them. However, economic stagnation grips this place, suggesting that many of these assets are not being fully employed. The region, which is home to 21 economically distressed rural counties, lags behind other places in North Carolina in several key indicators, including income, educational achievement, and health outcomes (Bunn and Ramirez 2011). Threats associated with climate change stand to aggravate these problems and place the assets of northeastern North Carolina at risk. Sea level rise, saltwater intrusion, flooding, and extreme weather events endanger core infrastructure, agricultural lands, tourism hotspots, and other vital areas (Riggs et al. 2008; Barlow and Wild 2002).

Sustainable development has emerged as one solution to address the dual pressures of economic hardship and climate change. This concept refers to development that uses resources in a manner that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission 1987). In this way, it provides economic opportunity while also protecting human, natural, and other resources or assets that are threatened by climate change and other environmental stressors. For example, renewable energy production, organic agriculture, and heritage-tourism are development activities that use natural resources sustainably while also providing economic and social benefits (Bradshaw 2011).

These are promising ways to simultaneously reduce poverty and the negative impacts of climate change, but knowing how a community can advance them remains difficult. Certain places may lack adequate infrastructure, and people may need business expertise, credit access, or other crucial elements for development. Securing government and private support for these things has been increasingly competitive since the economic recession beginning in 2007 and political influences may direct funding to other interests (Gray

2014). Given these obstacles, local economic developers, community organizations, and entrepreneurs need information and tools to help them better understand their assets and determine the right combination of local skills, funding, and outside consultation needed to facilitate sustainable development.

Fortunately, an active community of people and organizations are contributing to this pool of knowledge. One such organization is The Conservation Fund, a national non-profit that pursues environmental preservation and economic development, and the primary client for this research project. In particular, its Resourceful Communities Program is working with a wide network of grassroots and community partners in rural North Carolina to foster healthy, successful, and sustainable communities. The program takes a “triple bottom line” approach that integrates environmental stewardship, sustainable economic development, and social justice (Resourceful Communities 2014).

Educational institutions are other active participants that offer new insights through independent and collaborative research. In 2011, Elizabeth City State University published a “Green Report” that identified several sustainable development opportunities for northeastern North Carolina, including sustainable agriculture, eco-tourism, and recycling industries, among others (Bradshaw 2011). The authors of that report based these recommendations on the existing assets of the region, which they outlined using metrics from existing state and national databases. Another report, produced by researchers from the University of North Carolina and the NC Rural Economic Development Center and entitled “Small Towns Big Ideas,” described 45 different small-town development projects, some of which incorporated ideas of sustainability (Lambe 2006).

We supplemented these studies by further cataloging the assets of northeastern North Carolina and gathering new and existing case studies from around the United States that highlight successful sustainable development projects. In addition, we presented a tool for assessing specific opportunities with respect to economic, social, and environmental factors that are important to a cross-section of community members and other

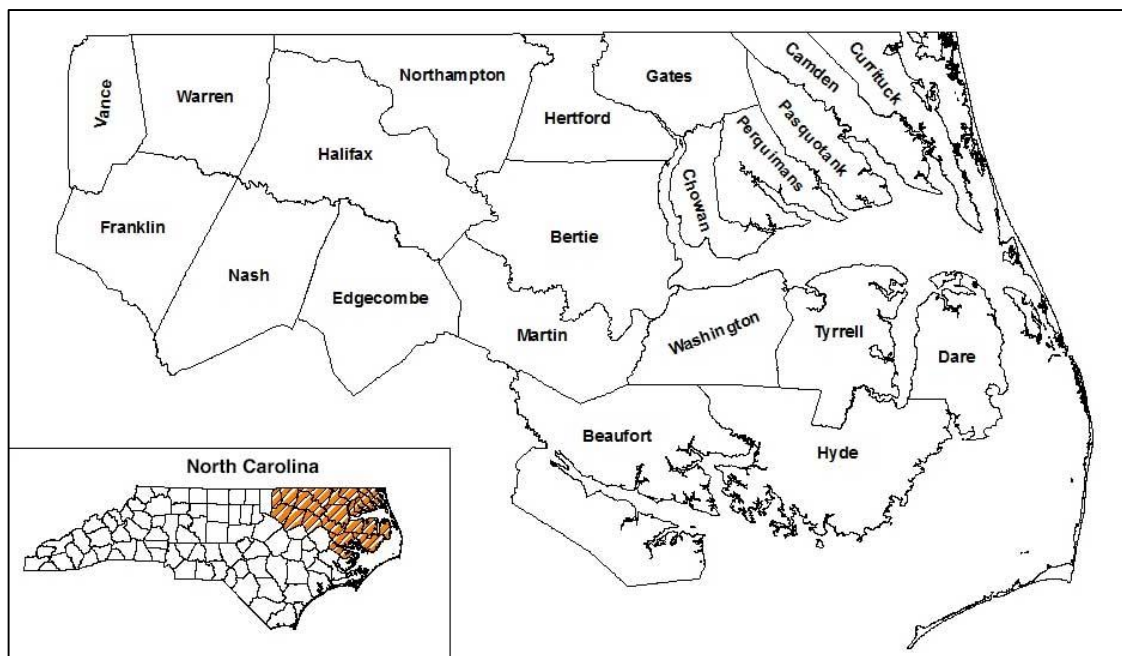


stakeholders. Equipped with this knowledge, local stakeholders will be better prepared to succeed in the face of uncertain economic and climate conditions.

## Background

The following background information provides the necessary context for considering sustainable development opportunities in northeastern North Carolina. The first section details the geographic and economic characteristics of the region, while the second explores the existing and future threats associated with climate change. The third section distinguishes among the various concepts, terms, and theories used when discussing development. The last section outlines some tools and techniques that help communities overcome the complexities of sustainable development.

### Geographic and Economic Landscape



**Figure 1.** Counties of northeastern North Carolina.

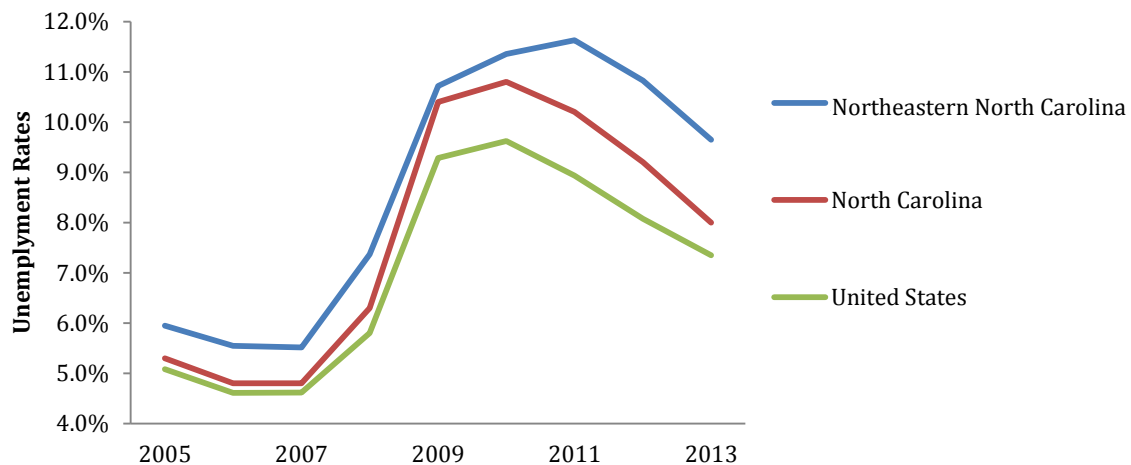
For the purposes of this research paper, northeastern North Carolina consists of 21 counties and represents the same study area considered in Elizabeth City State University's Green Report (Fig. 1). Of course, each of these counties and their communities possess unique qualities, but certain shared characteristics make it acceptable to consider them as a whole. All counties in this group, for example, are designated as "rural" by the U.S. Census Bureau, meaning they are home to fewer than 50,000 people and do not have a significant commuter population linked to a metropolitan area (U.S. Census Bureau 2012). The region

also represents some of the poorest economic conditions in North Carolina and the whole country. Data from the Census Bureau show that the counties in the study area have both low income levels and high unemployment rates, possibly a result of wider economic trends such as the movement of manufacturing jobs overseas, low commodity prices, and the decline of the tobacco industry (U.S. Census Bureau 2012). In 2013, the median household income for the 21 counties of the study area was \$38,536, or 85% of the state average of \$45,195, and 72% of the national average of \$53,046. Variation also exists within the study area. For example, the median household income for Bertie County was \$30,414, but \$54,822 for Currituck County. Only Currituck and Camden Counties have a median household income higher than the national average, and only the same two and Dare counties have an average household income higher than the state average (U.S. Census Bureau 2012).

The poverty level is another significant challenge for this area. In 2012, more than 140,000 people were designated as living under the poverty line in our study region. Among the 21 counties, seven had more than 25% percent of the population living below the poverty line: Hertford County, 30.5%; Halifax County, 29.2%; Tyrrell County, 28.9%; Warren County, 28.8%; Edgecombe County, 28.1%; Bertie County, 27%; and Vance County, 25.8%. But just as the median household income varies, levels of poverty vary widely across the region. Four counties (Dare County, Currituck County, Camden County and Martin County) have lower poverty rates than the national average of 15.9% (U.S. Census Bureau 2012).

Unemployment statistics in our study region are also sobering. According to the U.S. Bureau of Labor Statistics, the average unemployment rate in the region is much higher than the state and national averages (Fig. 2). The years following the 2007-2008 American subprime mortgage crisis were particularly devastating for northeastern North Carolina. Although the unemployment rate has decreased since 2011, this trend began well after the national and state unemployment rate started to descend. Even today, the unemployment rate remains well above pre-crisis levels.

Despite these challenges, there are several positive economic trends within the region. Farmland value is rising, ownership of houses among people of color is increasing, and access to credit through traditional and non-traditional lending institutions is increasing (Bradshaw 2011). These represent just some of the financial assets within northeastern North Carolina that might be leveraged for sustainable development opportunities.

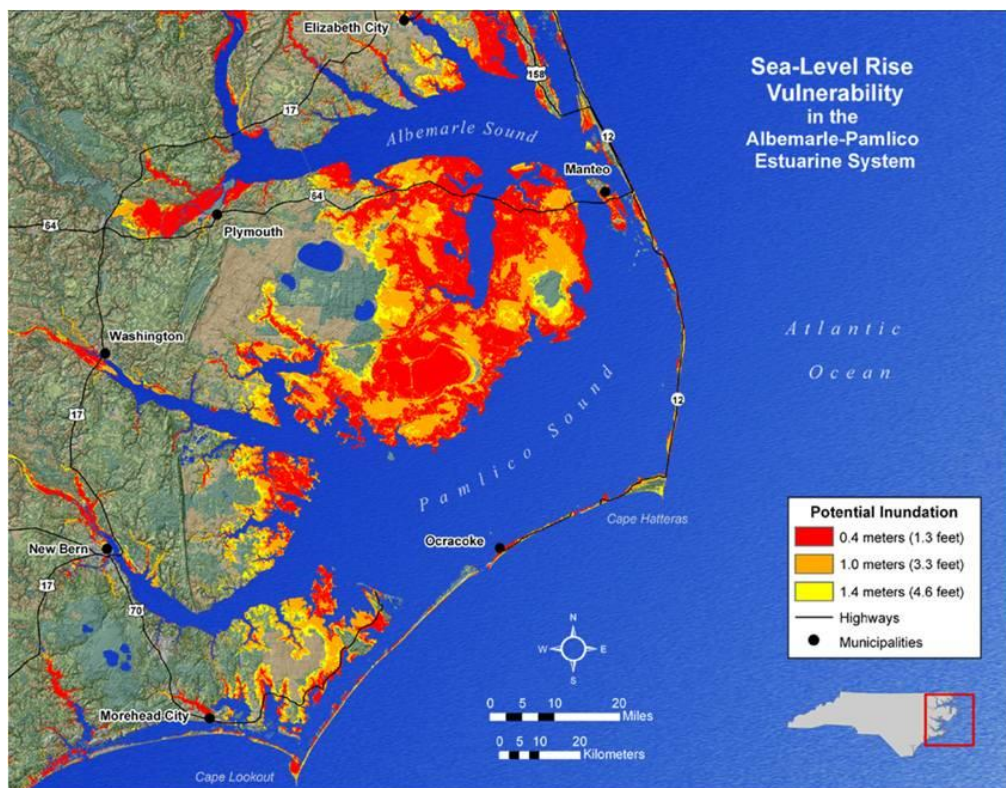


**Figure 2.** Unemployment rate of northeastern North Carolina, North Carolina, and the United States (U.S. Bureau of Labor Statistics 2013).

### Climate Change in North Carolina

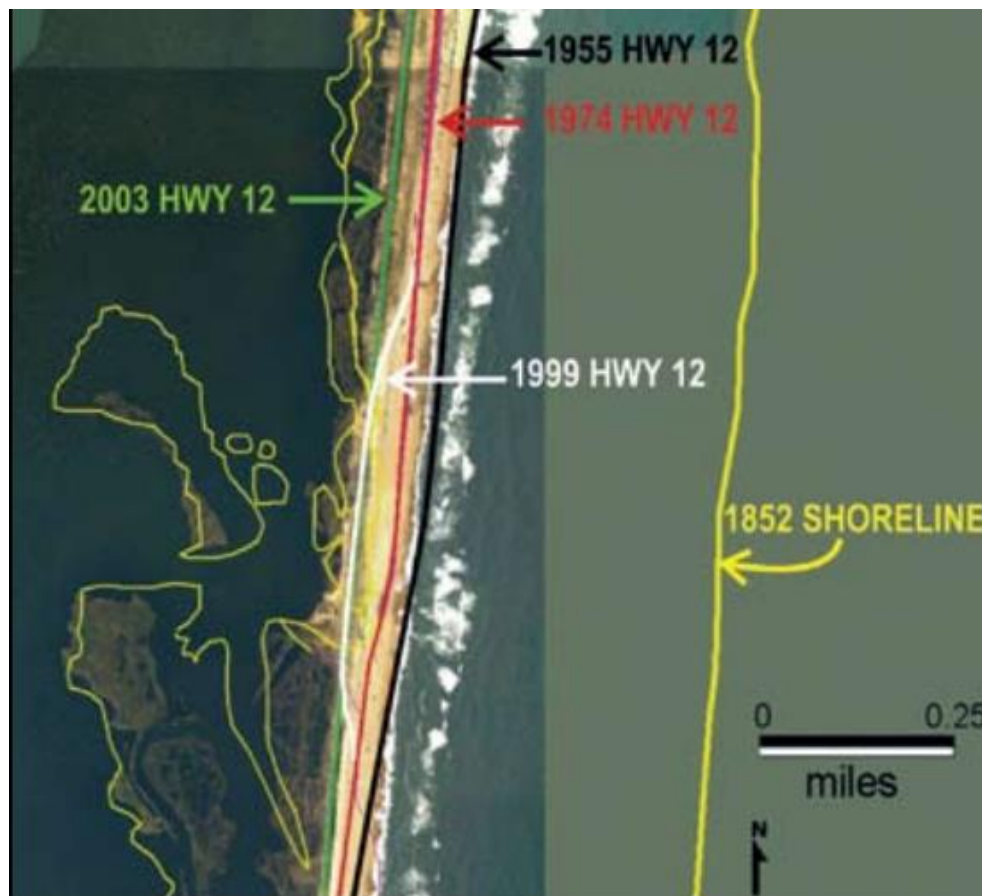
Global climate change brings new pressures to northeastern North Carolina that will compound dire economic problems and threaten the vital assets of the region. The long-term impacts of climate change are uncertain, but it is a subject of considerable research, and the major scientific authorities of the United States agree that it could have serious consequences. In 2010, the National Research Council concluded that “climate change is occurring, is very likely caused by human activities, and poses significant risks for a broad range of human and natural systems” (NRC 2010). Sea level rise, extreme weather events, flooding, and saltwater intrusion are areas of particular concern for northeastern North Carolina (Riggs et al. 2008; Barlow and Wild 2002).

According to the State Climate Office of North Carolina, the waters off the North Carolina coast have risen a foot since 1930, the farthest back the data can be traced (North Carolina Climate Office 2014). Conservative estimates indicate that sea level will rise 32 inches above the current measure in the next 100 years, and North Carolina's Albemarle peninsula could lose 1 million acres of land (Albemarle-Pamlico Conservation and Communities Collaborative [APCCC] 2009). Research from Brent et al. (2014) reveals a similar prediction, visualized in Figure 3. This is a major concern for a large proportion of the study area, including residents of Currituck, Carteret, Dare, Hyde, Tyrell, and Pamlico counties (Fig. 1). Rising seas undermine important infrastructure such as the Bonner Bridge in Dare County, North Carolina, where a deepening water channel currently compromises the pilings of that bridge (Barkin 2014). Natural resource loss (e.g., wetlands, farmland) and chronic shoreline erosion are other negative impacts that could impact other sectors of the economy such as recreation and tourism (Riggs et al. 2008).



**Figure 2.** Map of potential inundation areas in the Albermarle-Pamlico Estuarine System (Brent et al., 2014).

Extreme weather events such as hurricanes pose more risks. A study conducted by Robinson (2005) showed that North Carolina suffered from more frequent hurricane landfalls in the 1980s and 1990s. Although this trend followed a period of relative inactivity two decades prior, this increase may have been caused by a warming climate. Case studies clearly show how the combination of sea level rise and extreme weather events are reshaping coastal regions in North Carolina. Riggs et al. (2008) showed how sea level rise and chronic shoreline erosion have affected North Carolina communities by analyzing aerial photos in Dare County. The photos clearly depict coastal land loss and its influence on the major road in the area, State Highway 12 (Fig. 4).



**Figure 4.** Aerial photo of shoreline along State Highway 12 in Dare County, North Carolina (Riggs et al. 2008). The yellow line represents the shoreline in 1852, while the black line represents the shoreline in 2008. The proximity of State Highway 12 to a steadily eroding shoreline is a concern for communities and tourists that use this road to travel.



Figure 5 presents a different view of the impact of sea level rise on an existing development in southern Nags Head, Dare County, North Carolina. Here, encased sandbags attempt to hold back constant wave action and combat a chronically eroding shoreline. Housing, tourism traffic, beach access and wetlands are just the immediately affected assets of this area.



**Figure 5.** Eroding shoreline in southern Nags Head, Dare County, North Carolina (Riggs et al. 2008).

Saltwater intrusion is still another environmental issue brought on by climate change that threatens the assets of northeastern North Carolina. In this process, freshwater aquifers (underground sources of water) are contaminated by saltwater, adversely affecting users of that water, including residents, industry, and farmers. Saltwater intrusion is highly likely to be accelerated by sea level rise and extreme weather events (Barlow and Reichard 2010), both existing issues in the region. Barlow and Wild (2002) report that saltwater

intrusion is occurring along the Atlantic coast, including areas in both North and South Carolina.

This analysis suggests a clear and present vulnerability to the impacts of climate change in our study area that will not decrease without proper management. New concepts of development are needed to cope with these trends and conditions.

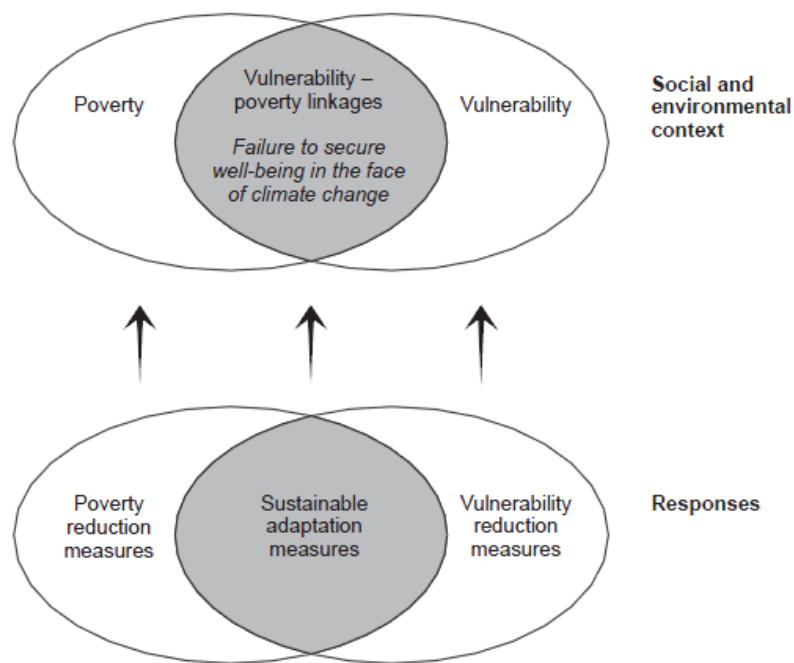
### **New Concepts of Development**

The new problems facing rural communities as a result of changing economic and climatic circumstances require fresh ideas of, or alternative approaches to, development. In particular, communities need business development and employment opportunities geared towards protecting, preserving, and restoring the natural environment while also generating economic welfare and social improvement. Generally referred to as “sustainable development,” the core principle of this philosophy is to consider economic growth within the context of its impact on people and nature (Malizia and Feser 1999). Concerns about over-consumption, environmental degradation, poor living standards, and inequality are driving this gradual shift in thinking. Questions about the consequences of climate change are another influential factor (United Nations Development Programme 2012). Communities exposed to environmental threats without access to financial and social resources are “vulnerable”; they are more likely to be negatively affected by climate change than communities with greater access to financial and social resources (Adger et al. 2003). As a result, there is a growing interest in identifying “win-win” strategies as a means of reducing poverty and vulnerability to climate change simultaneously (Fig. 6). These strategies can take the form of private businesses, infrastructure projects, or planning aimed at facilitating sustainable economic development.

Internationally, conferences such as the 2012 Rio +20 United Nations Conference on Sustainable Development enabled global discussions among governments about these topics. Although the United States has not signed the Kyoto Protocol, the nation is beginning to see similar interactions among federal, state, and local agencies. One example



is the Partnership for Sustainable Communities, a collaborative initiative<sup>1</sup> that attempts to “improve access to affordable housing and transportation while protecting the environment” (Environmental Protection Agency [EPA] 2014). Sustainable development planning at the local level is also taking hold, as evidenced by the 56 “sustainability plans” that were either in progress or completed in a U.S. city or county five years ago, including in North Carolina (ICLEI 2009).



**Figure 6.** Conceptual overview of vulnerability-poverty linkages and sustainable adaptation measures (Eriksen & O'Brien 2007).

These same patterns are also influencing development strategies in rural North Carolina. Researchers from the University of North Carolina and the NC Rural Economic Development Center described several case studies of entrepreneurship driven by sustainable principles (Lambe 2006). As an example, in 2006 government officials in Dillsboro, North Carolina, began to capture methane from a closed county landfill and use it to support the energy needs of greenhouses, blacksmith furnaces, pottery kilns and other

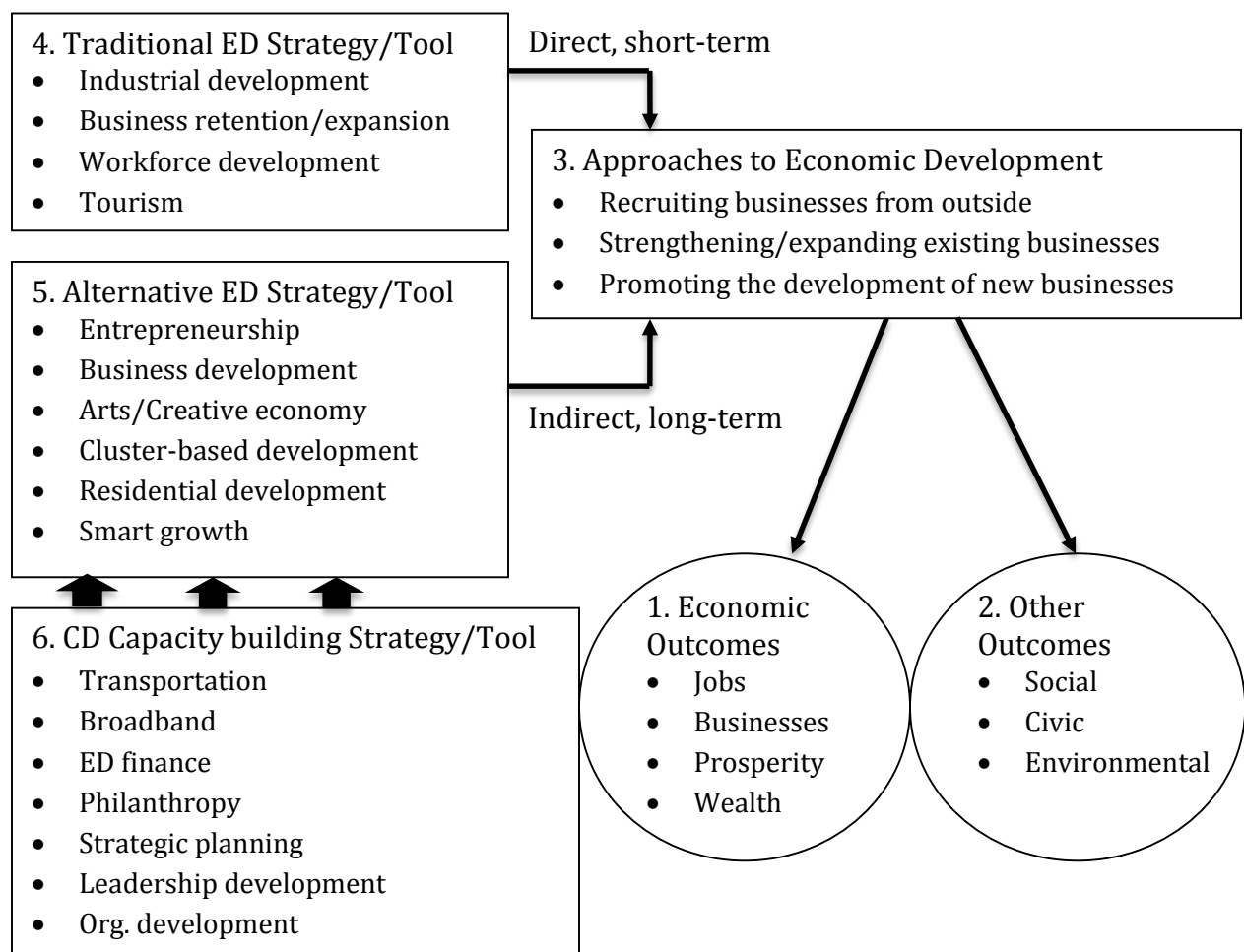
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<sup>1</sup> The three primary partners are the United States Department of Housing and Urban Development, Department of Transportation, and Environmental Protection Agency.

small businesses. Although promising, such case studies are not abundant, and too many rural areas are still mired in the type of economic malaise described above. One possible explanation for this is that local economic development still relies on traditional tools related to direct and short-term industry recruitment through strategies like tax deductions and special zoning permits (Malizia and Feser 1999). Karl Stauber offers a related argument, suggesting that rural areas are much too reliant on “older competitive advantages” like agriculture (Stauber 2001). Potential win-win opportunities such as heritage-tourism and agro-tourism, sectors that profit from guided tours of historical sites and farmland, do see success in some areas, but other places that lack the amenities required for those industries have a hard time moving away from low-wage farming and manufacturing jobs (Brown-Graham and Lambe 2008).

It is important that sustainable development initiatives be designed to address inequality and marginalization. Otherwise, businesses can participate in environmentally-friendly industries such as alternative energy without offering employment opportunities that meet certain minimum standards for an adequate livelihood (e.g., wages, benefits, and training). With this in mind, many writers make the distinction between “growth” and “development.” Growth is often associated with simple increases in economic output such as the number of jobs created or increases in property value. Development, on the other hand, refers to structural changes in a community that include restructuring of institutions and a more equitable distribution of wealth and well-being (Green and Haines 2008). This philosophy is deeply rooted in the practice of “community development,” which uses public participation as a means of improving the quality of life in an area. As one Chamber of Commerce office explains: “...for a community to be economically viable, it must make a concerted effort to work on both community development and economic development. They are interdependent and reinforce each other.” (Fort Collins 2014). Examples of community development include constructing new streets, sidewalks and sewer systems; facilitating the purchase of private land for public works projects; conducting leadership and technical training; and providing small loans to local businesses and entrepreneurs (Green and Haines 2008). These activities serve the dual purpose of empowering a community and making a place more attractive to outside and local entrepreneurs.

Clearly, many of the concepts overlap and sorting through them can become confusing. Lambe (2006) presents a framework that attempts to integrate many of these ideas in a coherent way (Fig. 7). On the right hand side, circle 1 describes the goals of economic development and circle 2 describes the goals of both sustainable and community development. On the left hand side, box 4 outlines the traditional tools used by developers to achieve these outcomes, while boxes 5 and 6 outline alternative or relatively new approaches. Taken together, these elements are commonly designated “community economic development” (CED) strategies.



**Figure 7.** Relationships among different components of community development (CD) and economic development (ED) strategies (Lambe, 2006). Community development is the “planned effort to build assets that increase the capacity of residents to improve their quality of life” (Green and Haines 2008) through activities such as those shown in box 6. Economic development, in contrast, is a planned effort to recruit, strengthen, and promote new business for economic benefit (Lambe 2006).

Organizations across North Carolina are active in this arena, attempting to facilitate the work of businesses and community members toward a more successful future. The Conservation Fund has invested over \$3 million in local projects, trained more than 10,000 community leaders, and created 600 jobs (Resourceful Communities 2015). Another prominent group is the NC Rural Economic Development Center, an organization that has historically re-granted state funds to support public-private partnerships known as community development corporations (CDC). CDCs seek to use the financial resources of the government for projects that leverage the strengths and desires of the local community (Green and Haines 2008). The North Carolina Community Development Initiative and the North Carolina Association of CDCs are two more supporting organizations of this kind. Self-Help Credit Union is one of the most distinguished community development credit unions in the region; it makes a concerted effort to finance low-income and minority borrowers, populations that are typically underserved by traditional credit markets (Self-Help 2015).

Many of these organizations, however, rely on donations, grants, and public funding to provide a support network for CDCs across the state. Unfortunately, a difficult economic and political climate in 2015 has diminished the pool of available resources for organizations of all types. For example, nearly all of the public funding typically provided to the NC Rural Center has been cut and shifted to a new state-controlled entity, the Limited Resource Communities Grant Program (Johnson 2014). As the former Director of Research and Innovation at the Rural Center bluntly put it: “The state of North Carolina has ended its financial support of nonprofit community economic development” (Gray 2014).

Amidst this ever-competitive funding environment, local stakeholders need more support designing and initiating successful development strategies. There are some fundamental barriers as well, including inadequate political will and technical capacity at the local level (UCLA 2010). With so much to consider, it can be difficult to know where to begin. We believe that asset-mapping, case study examination, and prioritization tools are three methods that practitioners can use as a starting point.

## **Innovative Tools for Community Economic Development**

Rural communities are continually searching for new and innovative ways to be competitive in changing economic and climatic circumstances. Asset-based economic development offers a unique approach that attempts to identify underutilized aspects of a place to be used in strengthening the local economy. It also represents a break from traditional methods of community economic development that rely on outside experts who focus on addressing specific needs – this can create a community that is dependent on outside help (Green and Haines 2008). Focusing on internal strengths as opposed to weaknesses can offer solutions that are more resilient to boom-and-bust business cycles or to changes in external funding or climate conditions; that can be incredibly empowering to community residents (Read et al. 2012). “Mobilize Maine” is a state initiative that catalogs patterns of commerce and specifically asks: “...what makes this place unique, special, or competitive...?” (NADO 2011). By 2015, Maine hopes to publish an economic planning document called a “Regional Economic Vision” that will describe how the state can capitalize on internal connections between industries and counties. Mobilize Maine offers an excellent example for North Carolina, given that both are rural states, they depend heavily on natural resources, and they have strong networks of community organizations.

The most common method of beginning an asset-based development process is to “map” the available skills, work experience, institutions, and resources in a community. These distinguishing characteristics are called “assets” and they can be grouped in several generic categories including human, social, physical, financial, environmental, political, and cultural (Green and Haines 2008). Once cataloged, communities can devise new and innovative development strategies that capitalize on these existing and often underused assets. In 2010, The Conservation Fund conducted a series of these asset-mapping exercises with eight different communities in northeastern North Carolina (Fig. 8).

Community members who participated in the asset-mapping exercises identified some of what they considered the most important assets in their communities. These were documented on paper maps and then uploaded to the internet using Google Maps online

software (Google 2015). The paper and electronic maps from those exercises are not publicly available and were obtained for this project through Mikki Sager, the director of the Resourceful Communities Program. The results from these exercises will be discussed in the next section.



**Figure 8.** Communities involved in The Conservation Fund’s 2010 asset-mapping exercises.

Examining case studies is another valuable technique for generating inspiration and new ideas for local community economic development. In his introduction to “Small Towns Big Ideas,” author William Lambe writes, “This collection of case studies is a response to the demand from civic leaders in North Carolina for *real stories*, from *real places*, that are confronting *real challenges* similar to those facing small communities everywhere” (Lambe 2006). By providing exposure to what other communities have achieved, local stakeholders will have models on which to build and gain confidence that unconventional strategies can and do work.

Case studies also encourage the use of underutilized assets. By identifying and understanding the steps other communities took to achieve sustainable development, local

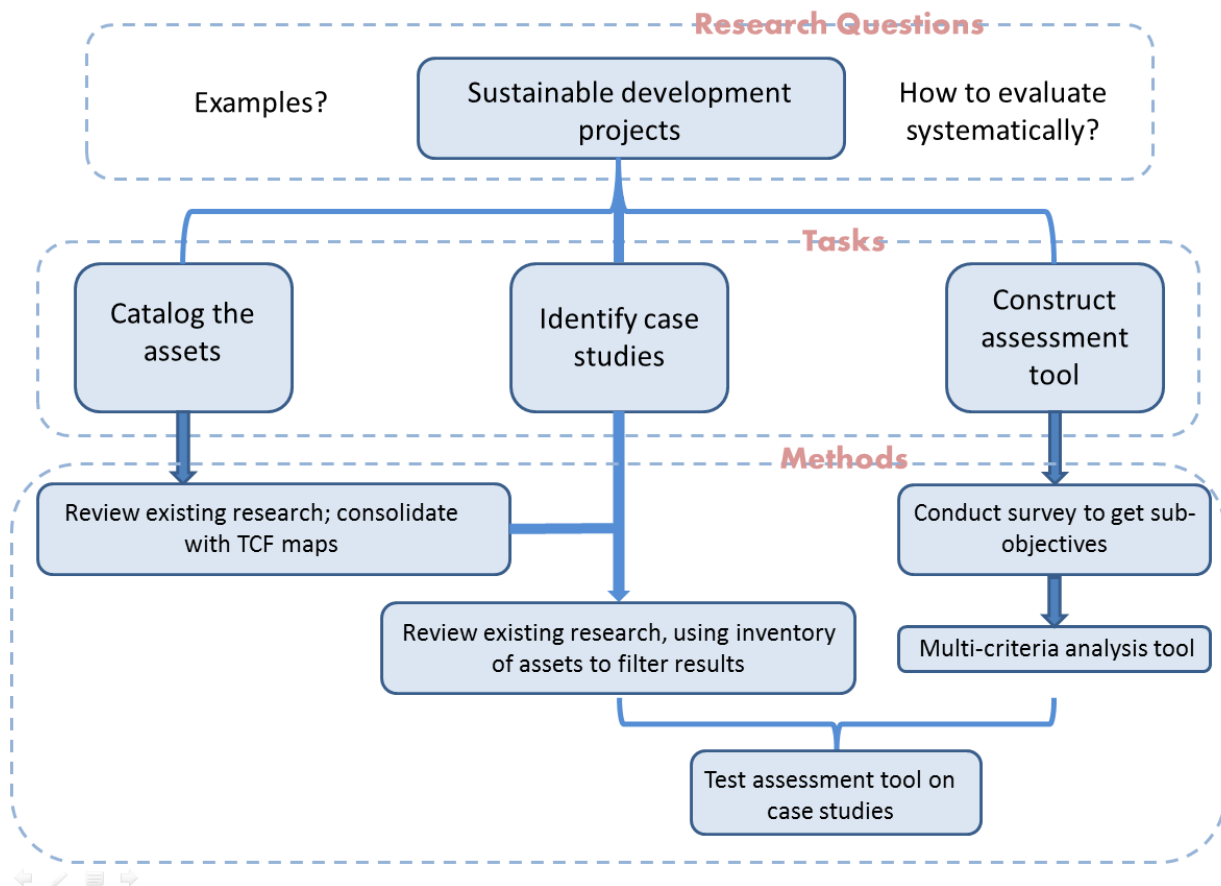
leaders in northeastern North Carolina will be able to draw analogies between the types and mix of resources used by case study communities and their own local resources. Ideally, case studies serve as blueprints for sustainable development projects. The inventory of assets and collection of case studies offered by this research project provides a necessary first step towards making those connections.

By understanding the strengths, weaknesses, and defining characteristics of certain opportunities, local leaders will be able to decide whether they are the right fit for their community. A scientific tool called multi-criteria analysis (MCA) is a common way to organize and prioritize this kind of information, enabling users to compare and contrast several different opportunities according to measures of performance on pre-determined goals called “criteria” (United Kingdom Department for Communities and Local Government: London [UKDCLGL] 2009). For example, one community may decide that high wage jobs are important, while another may value leadership opportunities for community members. Based on the information laid out in the MCA tool, users can decide which opportunity offers them the best chance to achieve those goals. Unfortunately, sometimes goals can be contradictory to each other. Energy production industries may provide jobs for the local people, but it may also bring some environmental risks. Although MCA will not always generate a definitive number, or rank, to identify the best opportunity, it can provide comparable information to guide users in making well-informed decisions based on their own interests and priorities (UKDCLGL 2009).

The objective of this research project is to provide local leaders with information and tools that will aid them in facilitating sustainable development in their communities. It provides (1) a broad ranging inventory of assets for Northeastern North Carolina, (2) a database of case studies that presents examples of successful sustainable development projects, and (3) a multi-criteria assessment tool that enables users to identify and prioritize the characteristics of those projects. The following section describes how this was accomplished in greater detail.

## Methodology

The following section presents an overview of the driving question, tasks, and methods for this research project. Figure 9 outlines these components in schematic form while the remainder of this section describes each part in greater detail.



**Figure 9.** Outline of this research project: “Asset Mapping and Sustainable Development in Northeastern North Carolina”. Each research task builds upon the previous one. The first task is to complete an inventory of assets, using it to complete the second task, which is to identify examples of successful case studies related to sustainable development efforts. Finally, we will construct and use a multi-criteria assessment tool to evaluate selected case studies.



## **Research Questions**

The purpose of this study is to identify sustainable community economic development projects in small towns and rural places that could serve as inspiration for projects to be developed in northeastern North Carolina. Suitable projects incorporate similar values and use assets already existing in northeastern North Carolina. By using the Triple Bottom Line approach, which focuses on economic, social, and environmental outcomes (Resourceful Communities 2014), as an organizational framework, we can help communities and their leaders understand the strengths and weaknesses of a project in a comprehensive way. Additionally, this approach integrates interests of northeastern North Carolina communities and The Conservation Fund, the sponsor of our project.

With this in mind, this project attempts to answer these primary research questions:

1. Are there examples of existing sustainable development projects that (a) are suitable for northeastern North Carolina and (b) satisfy The Conservation Fund's Triple Bottom Line approach?
2. Can we construct an assessment tool that characterizes the strengths and weaknesses of sustainable development projects and allows community members to prioritize these projects systematically based on their interests?

## **Research Tasks**

To address our research question, we outlined three successive tasks:

1. Create an inventory of assets in northeastern North Carolina.
2. Identify case studies of sustainable development projects that use similar assets to those available in northeastern North Carolina.
3. Construct and test an assessment tool for characterizing sustainable development projects based on a Triple Bottom Line approach and the interests of northeastern North Carolina.

The tasks are designed to build on one another. As a first step, cataloging the assets of the study area provides a general understanding of the types of resources available to the communities in our study area. With that in hand, we can start to filter existing sustainable development projects, focusing on the ones that are most likely to be successful in northeastern North Carolina. Finally, we constructed an assessment tool that helps to gauge how well a particular project fits the interests of community stakeholders.

The next section presents our findings and describes the methods used for completing each research task in greater detail.

## Inventory of Assets

We identified assets of northeastern North Carolina using the categorization scheme described by Green and Haines (2008), which includes seven broad types (Table 1).

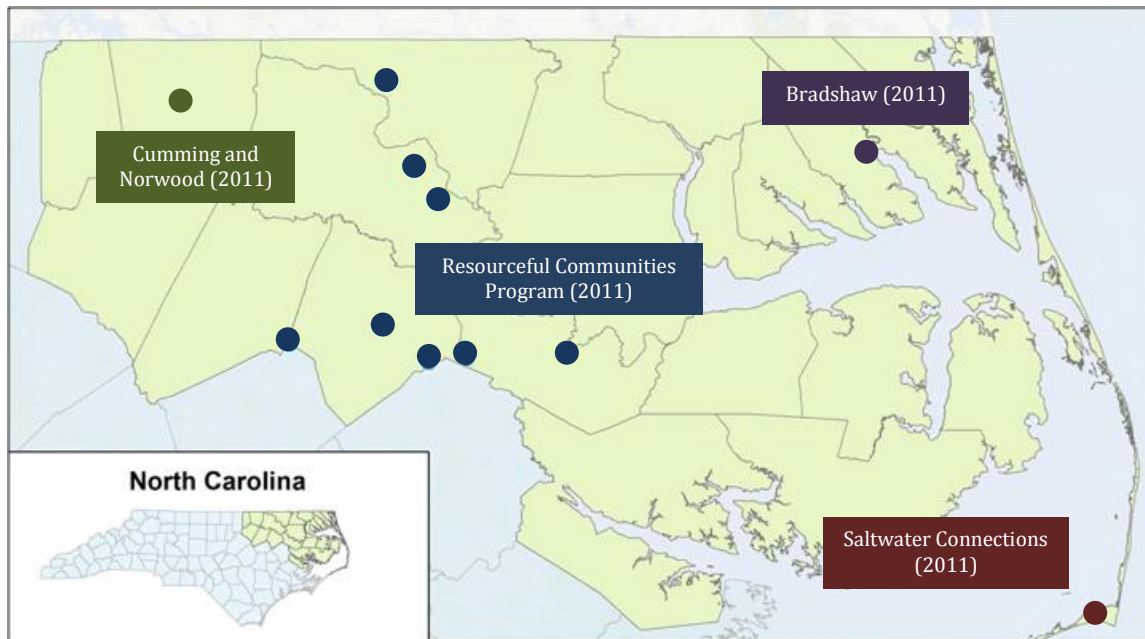
**Table 1.** Categorization of assets according to Green and Haines (2008). These categories represent the various resources that exist within a community.

Asset Category	Examples
<b>Human</b>	Population growth; workforce skills, tourist presence
<b>Social</b>	Community groups; religious organizations; social clubs
<b>Physical</b>	Housing; internet access; community college system
<b>Financial</b>	Community development lender; access to federal grants
<b>Environmental</b>	Fertile soils; wetlands; public park access
<b>Political</b>	County economic initiatives; zoning ordinances
<b>Cultural</b>	Watermen heritage; agricultural values; community festivals

The purpose of this categorization is to examine the assets systematically and to provide a guide for further work. To begin, we analyzed the assets identified by participants of The Conservation Fund’s mapping exercises described in the previous section, which were available as paper and digital maps (Resourceful Communities Program 2010).

Next, we accessed existing research that gave insight into the assets of the study area. For example, Saltwater Connections is a collaboration of community members and researchers that craft projects that integrate maritime heritage, public health, and economic diversity in the Outer Banks region of North Carolina. In 2010, this group visited 21 villages in Dare, Hyde, and Carteret Counties and produced a series of reports that identified assets “with particular focus on job retention, supplemental income generation, and small business support within the fishing industry and eco- and cultural heritage tourism” (Saltwater Connections 2011). Whereas the previous community asset-mapping facilitated by The Conservation Fund obtained opinions from those in the central portion of the study area,

these reports reflect opinions of coastal communities in the eastern portion of the study area (Fig. 10).



**Figure 10.** Major sources of asset information. The existing research on assets in northeastern North Carolina represents all parts of the study area.

Other work from Duke University postdoctoral researchers Carla Norwood and Gabe Cummings and faculty member Dr. Lisa Campbell engaged community members in the western portion of the study area. This group produced a short documentary called “Growing Local/Buying Local” that featured interviews with over 70 county residents and captured their opinions about the past, present, and future of sustainable agriculture in Warren County, NC (Cumming and Norwood 2011). These interviews offered a wealth of information about values and assets for this region as described directly by residents.

The Green Report, published by Elizabeth City State University, includes its own inventory of assets for northeastern North Carolina. Specifically, it discusses physical resources, housing, farms, financial assets, and people (Bradshaw 2011). Much of this information is useful; however, some of it relies on outdated data. For example, the report identifies population growth as an example of a human asset, but the latest projections from the U.S.

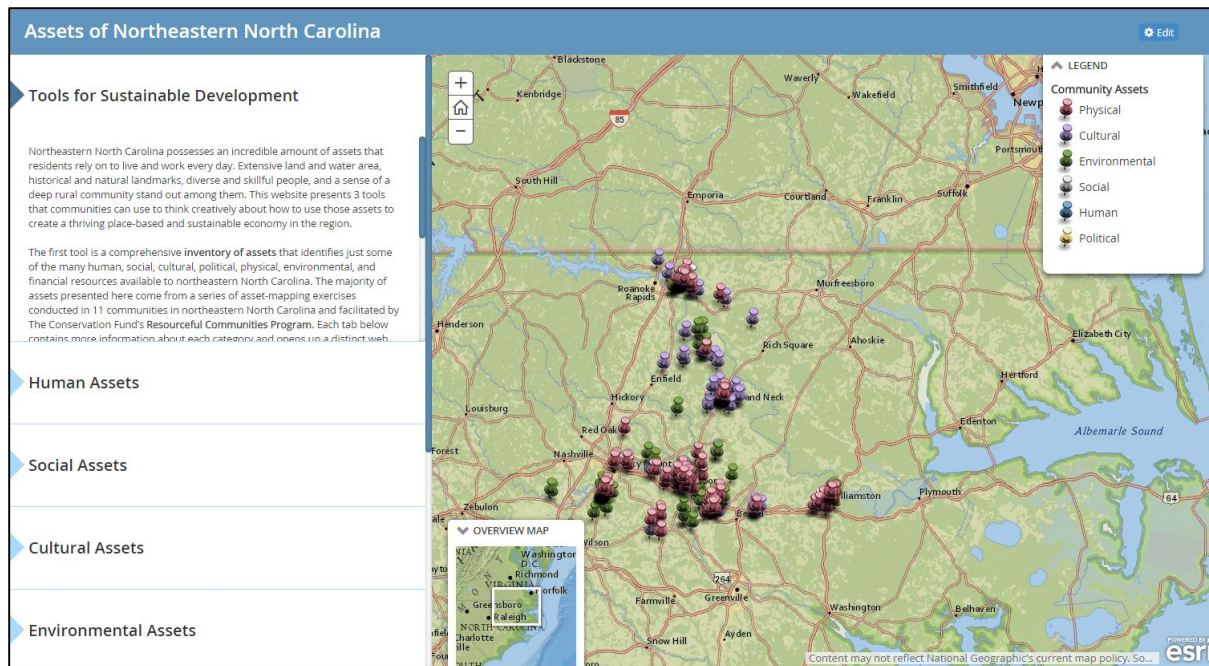
Census Bureau indicate population to be decreasing in the study area (U.S. Census Bureau 2013).

Taken together, these three resources provided an excellent basis for understanding the assets available in northeastern North Carolina communities; they represent voices from across the entire region. In addition to this, we conducted a thorough literature review and online search for other assets that could be added to the inventory. These included other human assets, such as non-profit organizations; political assets, such as economic incentive zones; and social assets, such as community festivals.

The completed inventory includes 529 unique assets, representing all seven categories outlined by Green and Haines (2008). We further divided these general categories into 26 readily understandable sub-categories (Table 2). More detailed descriptions of these sub-categories are located in the left panel of the project website, along with links to more information about assets that are not included as markers on the web map (Fig. 11). The website is available to all members of the public at the following website, which is freely accessible at the time of writing: <http://arcg.is/1zUaLXL>. Questions regarding the website should be directed at the staff of The Resourceful Communities Program, available for contact here: <http://www.conservationfund.org/what-we-do/resourceful-communities/our-experts>.

**Table 2.** Major and sub-categories of assets. The major categories come from Green and Haines (2008). The sub-categories were constructed after compiling and sorting assets from the sources outlined in this section.

Asset Category	Sub-Categories
<b>Human</b>	Community members, skilled labor, education, healthcare, non-profit community
<b>Social</b>	Community centers, public gathering spaces, social groups
<b>Cultural</b>	Heritage/history, artistic, faith community, festival or community events
<b>Political</b>	Local leadership, government
<b>Physical</b>	Infrastructure, housing, local businesses, commercial space, civic buildings
<b>Environmental</b>	Park/trail, land resources, water resources, wildlife
<b>Financial</b>	Tourism, grant/banking opportunities



**Figure 11.** Screenshot of web map portion of project website. The left panel contains descriptions of the sub-categories of assets, while the right panel displays the location of specific assets. Users can switch categories by clicking on the headings in the left panel. Clicking on individual markers in the right panel brings up more detailed information about each asset.

The majority of assets (477) come from the community maps provided by The Conservation Fund at the outset of this project. Each of these assets has a specific geographic location and is represented by a colored marker on the online web map. The colors represent the various sub-categories and are defined in the legend provided.

The remaining assets (52) come from the other sources outlined in this section, including existing research and documents from regional organizations. These sources do not provide a specific geographic location for most assets, and defining these locations is outside the scope of this project. Moreover, many assets are diffuse and lack specific geographic positions in the environment. For example, the Eastern North Carolina National Heritage Area Feasibility Study describes the rich maritime heritage of coastal North Carolina as a cultural asset (Carlino 2012). However, it is impractical and likely impossible to locate every specific site that represents this resource. Instead, we chose to forego assigning maritime heritage a specific geographic location and simply noted it in the

description panel of the web map and provided links to additional information. The following is an excerpt from the section of the website that discusses the heritage/history related assets of northeastern North Carolina:

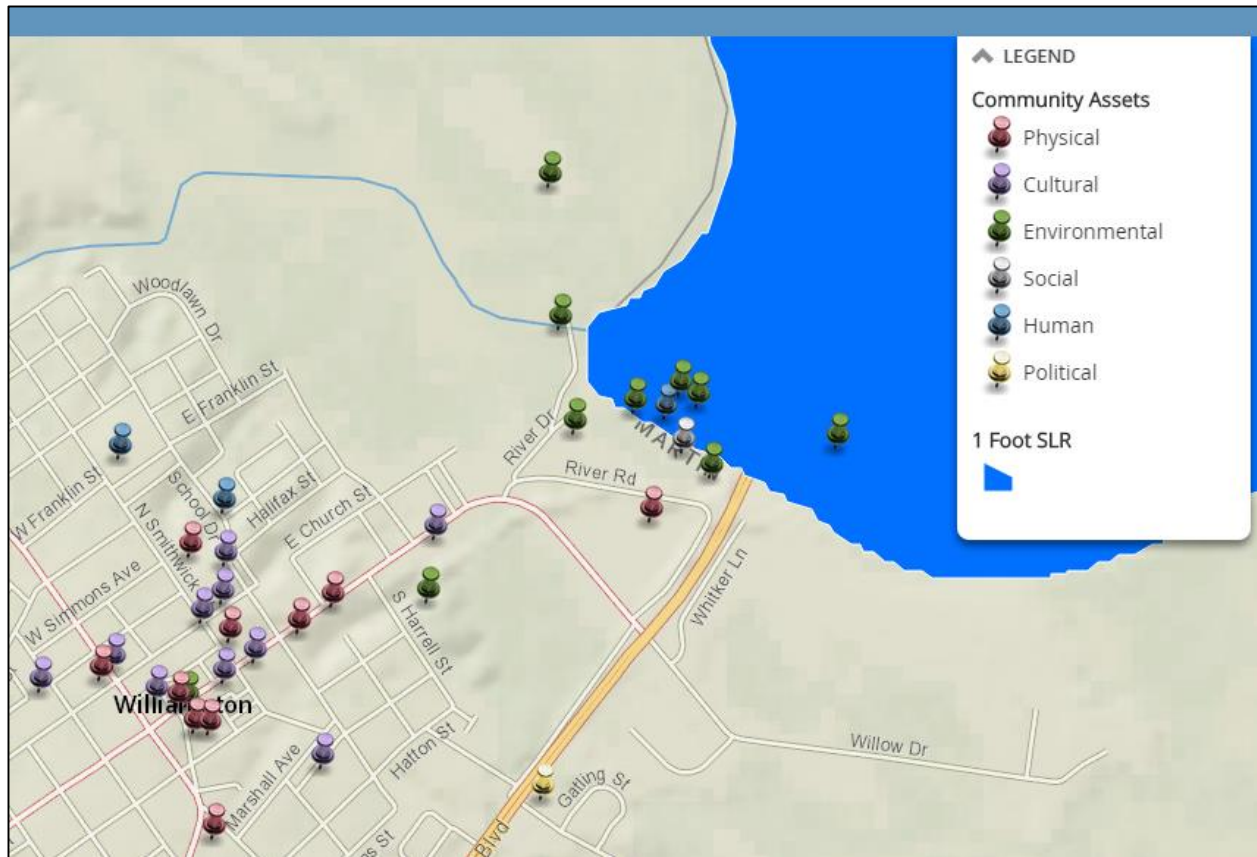
Northeastern North Carolina is home to an amazing amount of cultural resources that draw on the rich history and heritage of the region. The [Eastern North Carolina National Heritage Area Feasibility Study](#) describes many of these, especially focusing on Native American, African American, and European Colonial influences, and the decades of watermen activity in the region.

[Saltwater Connections](#), a collaborative of community members and organizations that focus on building strong communities in the Outer Banks, supports the [Down East Community Assets Map](#). On this web map, community members have identified several heritage/history sites, including a [Life Saving Station Historic Site](#), the [Frisco Native American Museum](#), and the [Graveyard of the Atlantic Museum](#).

The documentary “[Growing Local/Buying Local](#)” shows interviews from more than 70 community members in Warren County, who discuss many assets found in that area of the state. In particular, they spoke about history of small farm holders that were a major driver for the local economy.

The web map of assets also includes a visualization of a one-foot sea level rise for the coastline of northeastern North Carolina (Fig. 12). The data layer was downloaded from the National Oceanic and Atmospheric Administration’s (NOAA) Sea Level Rise and Coastal Flooding Impacts viewer (NOAA 2015). The NOAA viewer also has two and three-feet sea level rise visualizations available, but adding them to the project website caused a prohibitive slow down that made it unusable. Placing asset markers on the map alongside sea level projections emphasizes how community assets and future development projects may be exposed to threats associated with climate change.





**Figure 12.** Screenshot of web map portion of project website with a visualization of a one foot sea level rise from current levels. The purpose of including this layer is to emphasize how community assets and future development projects may be exposed to the threats of climate change.



## **Database of Sustainable Development Case Studies**

We conducted a systematic literature review and online search for existing community economic development projects from within the United States that were suitable models for northeastern North Carolina. In order to be eligible, the project had to fit in one of seven pre-determined categories: energy production, energy efficiency, recycling industries, sustainable agriculture, green education or heritage tourism. These categories were chosen based on their relative abundance and distinction as one of seven sectors that “show special promise based upon the existing assets and challenges for the 21 county, northeast North Carolina region” as identified by Elizabeth City State University’s Center for Green Research and Evaluation (Bradshaw 2011).

To ensure that the case studies were suitable for northeastern North Carolina, we filtered the initial search results based on the following conditions:

1. The assets used in the cases should be present in northeastern North Carolina, as determined by our inventory of assets.
2. The cases should be conducted in counties with fewer than 250 people per square mile – this is what designates a “rural” county according to the NC Rural Economic Development Center (Gray 2014).
3. The cases provided not only economic development, but also potential opportunities for social development and environmental benefit. To qualify, a project must fit in one of the seven “promising sectors” identified by Elizabeth City State University’s Green Report: clean energy production, energy efficiency, stormwater management, recycling, sustainable agriculture, heritage/eco-tourism, and green education.

Most case studies came from publicly accessible documents found with a thorough online search. Other case studies were provided by our client, Mikki Sager, director of the Resourceful Communities Program. The gathered case studies formed a small database of case studies that could be given directly to community leaders as inspiration for projects

they might develop in the future. This database is intended to show the possibilities of successful sustainable development in places similar to northeastern North Carolina.

The completed database includes 36 unique case studies, separated into 7 different categories according to Elizabeth City State University's Green Sectors<sup>2</sup> (Fig. 13). Ten case studies are related to energy efficiency; four are related to energy production; five are related to green education, resources, and training; three are related to heritage or eco-tourism; two are related to recycling industries and green manufacturing; four are related to stormwater management through low impact design; and eight are related to sustainable agriculture or biotechnology. The case studies describe projects from 18 different states.

Show 10 entries		Search: <input type="text"/>		
Name	Sector	Focus	Location	More Information
Downeast Transportation and Island Explorer	Energy Efficiency	Rural Transit	Hancock County, Maine	<a href="#">Link</a>
Greening the Block in Bowling Green	Energy Efficiency	Home Energy Efficiency, Greening the Block in Bowling Green	Bowling Green, Kentucky	<a href="#">Link</a>
Maupin Market	Energy Efficiency	Modernizing a Small Town Grocery Store	Maupin, Oregon	<a href="#">Link</a>
Name	Sector	Focus	Location	More Information
Showing 1 to 3 of 3 entries			Previous	1 Next

**Figure 13.** Screenshot of database portion of website. Case studies can be sorted by field or queried by keyword search.

The database is accessible on the project website (<http://arcg.is/1zUaLXL>), presented as an organized spreadsheet. Each row contains the name, sector, primary focus, location, and resource link for a particular project. To make it easier for users to browse the case studies,

<sup>2</sup> These sectors are energy production, energy efficiency, stormwater management, recycling industries/green manufacturing, sustainable agriculture/biotechnology, heritage/eco-tourism, and green education.

the spreadsheet includes sorting and searching features. These features make it possible to sort projects by individual fields, as well as query them by keyword search.

As a next step, we chose three case studies from among all the cases we identified for which we had detailed information and used them to develop and test our assessment tool, discussed in the next section. The first case study was Feast Down East, a sustainable agricultural project in southeastern North Carolina that connects small farmers to consumers. The second was Jackson County Energy Park, an alternative energy project in western North Carolina that powers local business by capturing methane gas released from a landfill. The third was Watermen Heritage Tour, a heritage tourism project in Chesapeake Bay, Maryland, that provides training and business services to watermen interested in providing tours related to commercial fishing.

Using The Conservation Fund's network of partners, we contacted and interviewed subjects who were involved in the development of those three projects using email and telephone. We conducted a total of six telephone interviews with four different individuals, each lasting between 30-60 minutes. Access to these individuals was extremely valuable in understanding the nuances of each case study and in obtaining information not available through public documentation. Appendix A includes the consent script that we presented to our interview subjects. The three selected case studies are described and analyzed in the following section.

## Assessment Tool

The next task was to assess three case studies using multi-criteria analysis in order to show more clearly how they can be used as models for sustainable development in northeastern North Carolina. Additionally, it provided an opportunity to develop and demonstrate the use of an assessment tool useful for evaluating sustainable development projects using multi-criteria analysis. Multi-criteria analysis is a decision making process useful for comparing alternative options for achieving pre-determined *objectives*. These objectives can be broken down in to more specific *sub-objectives*, if necessary. A unique feature of multi-criteria analysis, as compared to similar techniques like cost-benefit analysis, is the ability to incorporate qualitative objectives into the assessment framework. Both quantitative and qualitative objectives are scored using a series of metrics known as *criteria*<sup>3</sup>, which serve to measure how well an objective is accomplished (UKDCLGL 2009). For example, for an objective, “economic benefit,” possible criteria could be “number of jobs created” or “wages provided by the jobs.” The final table of alternatives and appraised objectives is commonly referred to as a *performance matrix*, what we are calling an assessment tool. In some applications of multi-criteria analysis, users can rank alternatives based on a combined score of performance ratings for all criteria. However, for this project we are going to stop with the performance matrix and leave judgments about the overall value of each alternative to stakeholder deliberations.

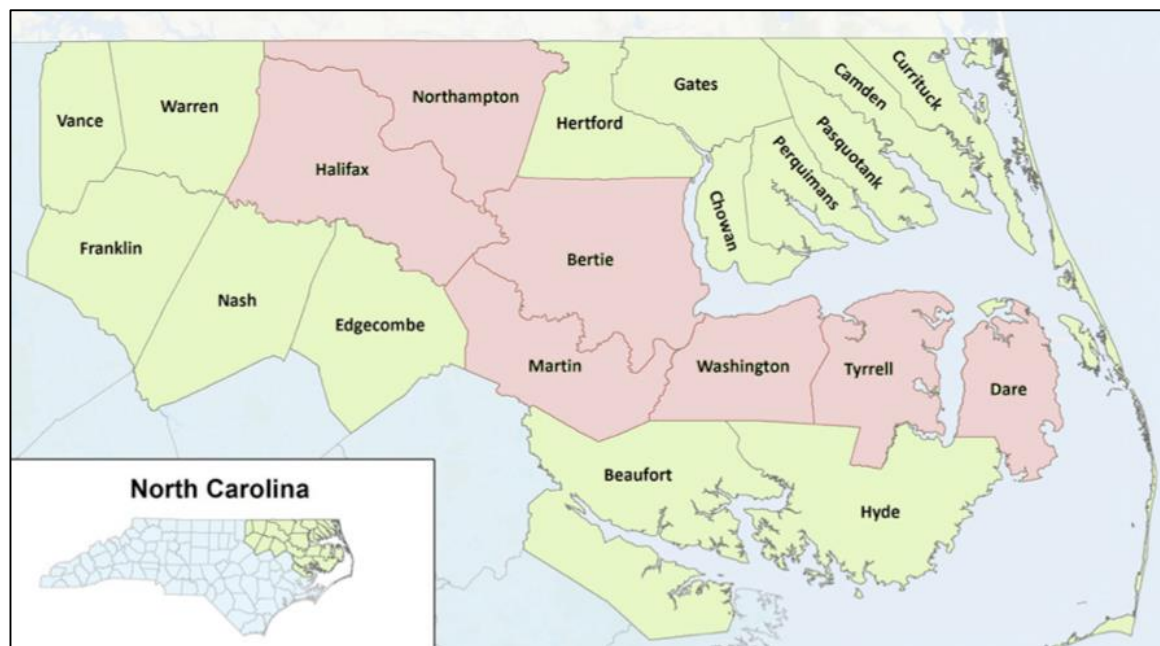
Following this design, the overall objective for each option was to create community development opportunities that adhere to the Triple Bottom Line approach. Accordingly, we defined three generalized sub-objectives: achieving economic, social, and environmental benefits. These three sub-objectives represent the stated values of The Conservation Fund’s Resourceful Communities Program (Resourceful Communities 2014).

The assessment tool also needed to incorporate community values in order to adequately measure whether or not a project was suitable for northeastern North Carolina. To accomplish this, we created a lower level of sub-objectives reflecting the interests of

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<sup>3</sup> Also referred to as factors, attributes, or performance dimensions

community members in the study area as interpreted by us. To help define these sub-objectives, we administered a survey to individuals who were included in The Conservation Fund's available network of private, public, and non-profit partners from across northeastern North Carolina. The survey was comprised of seven open-ended questions that asked respondents to describe what they believed to be important considerations for assessing community economic development projects (Appendix B). We implemented the survey electronically using the online software Qualtrics, distributed it via email, and received a total of six completed responses. Although we could not verify exactly where each respondent was from, Figure 14 shows a map of where respondents said they primarily worked. In terms of occupation, three respondents said they worked for a local government, two said a non-profit organization, and one said the media industry. One question in the survey prompted participants to state their priorities among economic, environmental, and social factors; however, because of the limited responses, we did not include responses to this question in our analysis.



**Figure 14.** Map of the counties in which survey respondents primarily work (in red).

A thorough literature review of existing research from within the study area was used to identify additional sub-objectives. "Growing Local/Buying Local," the previously

mentioned documentary produced by Gabe Cummings and Carla Norwood, proved again to be an outstanding source for this portion of the research project (Cumming and Norwood 2011). Focus groups conducted by Shannon Switzer and Colin Stief in early 2014 that included members of the North Carolina commercial fishing industry provided another insightful source of community values (Switzer and Stief 2014). One more example was the synthesized results of a series of public listening sessions in the Albemarle-Pamlico region regarding sea level rise in that area (APCCC 2009). In addition to the surveys and the literature review, we developed more sub-objectives by interpreting the publications of local media. A full list of referenced material is listed in Appendix C.

We applied our assessment tool to the three case studies briefly described in the previous section. For each sub-objective, we answered the question: does this case achieve the sub-objective, and how well? We relied heavily on publicly available information about the case studies to answer this question. Telephone interviews with staff members involved in each project provided answers to any gaps in our knowledge.

Following the descriptive portion of our application, we analyzed the results of each case study and defined criteria that were useful for comparing the performance of options for each sub-objective. The goal was to create criteria that were specific enough to be meaningful, but generic enough to apply to many different projects. Finalizing these criteria completed the construction of the assessment tool.

The complete assessment tool includes 32 unique sub-objectives and related criteria, separated into the three categories of the Triple Bottom Line Approach: economic, social, and environmental (Tables 3, 4, 5). The surveys provided 10 sub-objectives, while other sources (Appendix C) provided the remaining 22.

To make the tool available to users, we placed the list of sub-objectives and criteria in their own sections on the project website. Users can download them as a single portable document file (PDF) from their browsers (<http://arcg.is/1zUaLXL>).

**Table 3.** List of economic sub-objectives and criteria for assessment tool.

Economic
<p><b>EC1. Creates or supports permanent jobs to local people</b></p> <p>Number of jobs created or supported</p>
<p><b>EC2. Creates or supports jobs with a living wage</b></p> <p>Yes: The project creates or supports jobs that provide a living wage  No: The project does not create or support jobs that provide a living wage</p>
<p><b>EC3. Owned and/or operated locally</b></p> <p>√: The project is completely owned and operated locally  --: The project is partially owned and operated locally  x: The project is not owned and operated locally</p>
<p><b>EC4. Has adequate funding to ensure ongoing implementation</b></p> <p>√: The project is self-sustaining and does not require outside funds to ensure future operation  --: The project has enough funding from outside sources to ensure future operation  x: The project does not have enough funding to ensure continuing operation</p>
<p><b>EC5. Offers free or affordable activities, services, and/or products</b></p> <p>√: The project offers many free or affordable activities and/or services  --: The project offers some free, affordable, or moderately expensive activities and/or services  x: The project does not offer any free or affordable activities or services</p>
<p><b>EC6. Ability to cluster with other similar projects to create something regional, including connected by a supply chain or other business relationship</b></p> <p>√: The project has a direct link with similar projects in the area, with which they communicate, share lessons learned, and/or create business partnerships  --: The project has the potential to link with similar projects in the area, with which they can communicate, share lessons learned, and/or create business partnerships  x: The project has no connection or potential to connect with similar projects in the area</p>
<p><b>EC7. Attracts people from outside the county to come spend money locally</b></p> <p>√: The project attracts a large amount of people from outside the county  --: The project attracts a small amount of people from outside the county  x: The project does not attract people from outside of the county</p>
<p><b>EC8. Supports a cottage industry (i.e., home-based businesses)</b></p> <p>√: The project supports and/or creates home-based businesses  --: The project has the potential to support and/or create home-based businesses  x: The project does not support or create home-based businesses</p>

**Table 4.** List of social sub-objectives and criteria for assessment tool.

Social
<p><b>SC1. Encourages entrepreneurial spirit by providing business development services such as financial training, certification courses, access to capital, and mentorship</b></p> <p>√: The project strongly encourages entrepreneurial spirit.  --: The project somewhat encourages entrepreneurial spirit.  x: The project does not encourage entrepreneurial spirit.</p>
<p><b>SC2. Connected to local culture/heritage</b></p> <p>√: The project is strongly connected to local culture/heritage.  --: The project is weakly connected to local culture/heritage.  x: The project is not connected to local culture/heritage.</p>
<p><b>SC3. Exemplifies aspects of rural character, including both physical and emotional ties to the land and/or water</b></p> <p>√: The project has a strong physical or emotional tie to the land and/or water.  --: The project has some physical or emotional tie to the land and/or water.  x: The project does not have any tie to the land or water.</p>
<p><b>SC4. Engages young people (≤18 years old) and encourages inter-generational cooperation</b></p> <p>√: The project actively engages young people with activities and/or services and encourages inter-generational cooperation.  --: The project occasionally engages young people with activities and/or services and encourages inter-generational cooperation.  x: The project does not engage young people or encourage inter-generational cooperation</p>
<p><b>SC5. Encourages cooperation among individuals and/or organizations</b></p> <p>√: The project encourages cooperation among individuals and/or organizations  --: The project has the potential to encourages cooperation among individuals and/or organizations  x: The project does not encourage cooperation among individuals or organizations</p>
<p><b>SC6. Has local institutional capacity to sustain itself</b></p> <p>√: The project has strong local institutional capacity to sustain itself  --: The project has moderate local institutional capacity to sustain itself  x: The project does not have the local institutional capacity to sustain itself</p>
<p><b>SC7. Engages schools</b></p> <p>√: The project actively engages students and/or schools with activities and services  --: The project occasionally engages student and/or schools with activities and services  x: The project does not engage students or schools</p>
<p><b>SC8. Generates awareness of social issues (e.g., public health, crime, educational attainment)</b></p> <p>√: The project generates significant awareness of social issues to many people  --: The project generates some awareness of social issues to a limited number of people  x: The project does not generate awareness of social issues</p>



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**SC9. Engages the public with activities and services, including both local residents and visitors**

- √: The project actively engages the public with activities and services
- : The project occasionally engages the public with activities and services
- x: The project does not engage the public

**SC10. Engages communities of faith**

- √: The project actively engages communities of faith with activities and services
- : The project occasionally engages communities of faith with activities and services
- x: The project does not actively engage communities of faith

**SC11. Teaches new life and/or job skills**

- √: The project provides many new life/job skills
- : The project provides some new life/job skills
- x: The project does not provide new life/jobs skills

**SC12. Builds individual and community self-esteem and self-worth**

- √: The project is very likely to help build individual and community self-worth and self-esteem
- : The project may help to build individual and community self-worth and self-esteem
- x: The project is not likely to help build individual and community self-worth and self-esteem

**SC13. Is accessible to and engages people of color and under-resourced populations**

- √: The project is accessible to and actively engages people of color and under-resourced populations
  - : The project is accessible to and occasionally engages people of color and under-resourced populations
  - x: The project is not accessible to or does not engage people of color and/or under-resourced populations
-

**Table 5.** List of environmental sub-objectives and criteria for assessment tool.

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**Environmental**

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**EN1. Changing Environmental Conditions**

The following three sub-objectives evaluate vulnerability to the major threats to development in northeastern North Carolina related to climate change. Vulnerability is comprised of three characteristics: adaptive capacity, which is the ability of a project to be resilient and absorb climate impacts; exposure, which refers to how geography places a project at risk; and sensitivity, which is the degree to which a project would be affected by climate stresses given the type and amount of resources it depends on.

**EN1a. Limits vulnerability to sea level rise**

- √: The project is not vulnerable to sea level rise
- : The project is moderately vulnerable to sea level rise
- x: The project is highly vulnerable to sea level rise

**EN1b. Limits vulnerability to increased levels of major storm activity**

- √: The project is not vulnerable to increased major storm activity
- : The project is moderately vulnerable to increased major storm activity
- x: The project is highly vulnerable to increased major storm activity

**EN1c. Limits vulnerability to shifting temperature and precipitation patterns**

- √: The project is not vulnerable to shifting temperature and precipitation patterns
- : The project is moderately vulnerable to shifting temperature and precipitation patterns
- x: The project is highly vulnerable to shifting temperature and precipitation patterns

**EN2. Uses minimal water inputs**

- √: The project does not increase local water use
- : The project moderately increases local water use
- x: The project significantly increases local water use

**EN3. Uses minimal energy inputs**

- √: The project does not increase local energy use
- : The project moderately increases local energy use
- x: The project significantly increases local energy use

**EN4. Improves availability of energy**

- √: The project increases the availability of energy to local communities
- : The project does not affect the availability of energy to local communities
- x: The project decreases the availability of energy to local communities

**EN5. Improves availability of food**

- √: The project increases the availability of food to local communities
  - : The project does not affect the availability of food to local communities
  - x: The project decreases the availability of food to local communities
-

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**EN6. Uses natural resources in a way that maintains, enhances, or restores their quality and/or stock**

- √: The project improves quality and/or stock of natural resources
- : The project does not affect the quality and/or stock of natural resources
- x: The project reduces the quality and/or stock of natural resources

**EN7. Does not produce excess noise above levels and types normally associated with the location of the development**

- √: The project does not generate noise
- : The project generates some noise, but the noise is tolerable
- x: The project generates excess noise

**EN8. Improves air quality**

- √: The project helps to improve local air quality
- : The project does not affect local air quality
- x: The project negatively affects local air quality

**EN9. Improves water quality**

- √: The project helps to improve local water quality
  - : The project does not affect local water quality
  - x: The project negatively affects local water quality
- 

Most of the sub-objectives presented in Tables 4, 5, and 6 are self-explanatory, however, three may be unclear and require more detailed explanations: clustering (EC6), rural character (SC3), and changing environmental conditions (EN1).

Cluster development refers to the concept of stimulating local and regional economic activity by concentrating interconnected businesses in a geographically concentrated area (Irshad 2009). For example, The Conservation Fund's Natural Capital Investment Fund has spearheaded the Value Chain Cluster Initiative in West Virginia, a program that facilitates business planning and partnership building between producers, processors, aggregators, and distributors involved in the local food movement of four distinct regions (The Conservation Fund 2015). The purpose of this and other similar cluster initiatives is to increase the success of individual businesses and organizations by drawing on the success of the entire group (Irshad 2009). Accordingly, sub-objective EC6 emphasizes sustainable

development projects that have the potential to cluster with similar or related projects in the same region.

Jason Gray, formerly of the North Carolina Rural Economic Development Center, describes rural character as having an “emotional and financial tie to the land or water in a way that is profound,” and feeling a “deep connection to a place...even if it is not the primary source of income” (Gray 2014). Accordingly, sub-objective SC3 emphasizes sustainable development projects that incorporate emotional or tangible connections to the land and water in their primary activities.

An important component of the assessment tool is the emphasis it places on a project’s vulnerability to changing environmental conditions, including sea level rise, increased major storm activity, and changing precipitation and temperature patterns. Sub-objectives EN1a, EN1b, and EN1c evaluate vulnerability with a framework that uses definitions provided by the Intergovernmental Panel on Climate Change (IPCC) and that is commonly used by governments, businesses, and planning organizations to prepare for climate change (Southwest Climate Change Network 2015). Following this framework, vulnerability is comprised of three components: exposure, which refers to how geography places a project at risk; sensitivity, which is the degree to which a project would be affected by climate stresses given the type and amount of resources it depends on; and adaptive capacity, which is combination of “strengths, attributes, and resources” available to a project that “can be used to prepare for and undertake actions to reduce” the impacts of climate change (IPCC 2012).

## **Application of Assessment Tool to Selected Case Studies**

The following three case studies were characterized using the assessment tool presented in the previous section. These provide examples of how a user might use the tool to systematically explore the strengths and weaknesses of a particular sustainable development project. Each case study begins with an overview of the project and follows with a description of how the project meets or does not meet the sub-objectives of our Triple Bottom Line assessment framework. The reference code preceding each sub-objective heading refers to Table 3 through Table 5 in the previous section.

### **Feast Down East<sup>4</sup>**

Feast Down East is a non-profit program located in southeastern North Carolina. Its goal is to connect local food producers to institutional markets such as restaurants, grocers, schools and hospitals. It focuses on providing these markets with food grown within a 50-mile radius. Farmers can send their products to the distribution center of Feast Down East, and then it will deliver the food to buyers. Feast Down East incorporates programs of research, networking, education, marketing and distribution of local food.

Feast Down East was founded in 2006 by Leslie Hossfeld of the University of North Carolina, Pembroke and Mac Legerton, from the Center for Community Action. Since its inception, Feast Down East has made remarkable progress on economic, social and environmental targets. It has helped to create job opportunities, generate income for local communities, emphasize local heritage, and reduce carbon emissions. A detailed description of the achievements will be given in the following sections.

We think that Feast Down East is a good example of a sustainable agriculture project directed at the county level that can provide inspiration to northeastern North Carolina counties.

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<sup>4</sup> The source of information for this section is personal communication with Jane Steigerwald, director of Feast Down East, February 2015, except where other sources are cited explicitly.

## ***Suitability to Northeastern North Carolina***

### ***Green Sector: Sustainable Agriculture***

According to the Green Report by Elizabeth City State University's Center for Green Research and Evaluation (Bradshaw 2011), sustainable agriculture is one of seven promising sectors that have great potential in the 21 counties of northeastern North Carolina. According to the report, locally sourced food products can increase income to local farmers and other stakeholders. Sustainable agricultural practices, which are associated with small-scale and middle-scale farms that use precise and scientific farming methods, can also help improve community health conditions by eliminating "food deserts," areas that have little to no access to fresh fruits and vegetables (Bradshaw 2011). Moreover, studies showed that no-till farming, which is more likely to be conducted in small-scale and middle-scale farms, will reduce soil carbon emission significantly compared to traditional large-scale tillage practices (Robertson et al., 2014).

The Green Report also found that agricultural jobs in northeastern North Carolina have lower wages, there were fewer farmers' markets in the region, adult diabetes and obesity rates were higher than the entire state, and there may be various sources of funding available to the region, such as The Golden LEAF Foundation, and The North Carolina Tobacco Trust Fund Commission.

Through its aggregation and distribution services and social programs, Feast Down East increases local residents' access to foods produced by small-scale and middle-scale local farmers and enables the farmers to focus their time and energy on production, rather than packaging, marketing and transportation. In addition, farmers can learn to grow agricultural products organically, which reduces fertilizer and chemical expenses and reduces environmental impacts. With more healthy foods available to the markets and institutions, health conditions of local communities' members may be improved.

### *Rural Emphasis*

Feast Down East works directly with rural counties, including Pender, Onslow, Jones, Lenoir, Duplin, Sampson, Bladen, Columbus, and Brunswick. In these places, the project focuses on increasing income to small farmers (especially limited resource farmers, including women farmers and farmers of color), connecting these farmers to various markets, improving local health conditions, and attracting funds to develop local sustainable agriculture.

### *Northeastern North Carolina Assets*

Feast Down East uses many assets that are available in northeastern North Carolina (Table 6). These assets include non-profit organizations or communities, educational resources, skilled workers, smallholder farming heritage, farmlands, and grant funding. Thus, Feast Down East provides a good example of how to use these assets in sustainable development of northeastern North Carolina counties.

**Table 6.** Assets used in the Feast Down East project that are also present in northeastern North Carolina.

Human	Cultural	Environmental	Financial
Skilled workers; non-profit community; educational institutions	Smallholder farming heritage	Farmland; agriculture infrastructure; fertile soils; wetlands	Grant funding; agricultural lending

### *Assessment of Objectives*

#### *Economic*

##### *EC1. Jobs*

By 2013, Feast Down East directly created 73 full-time jobs, as well as some part-time job positions. Most of the jobs were created in the distribution center of Feast Down East, including administrative officers, truckers, and marketing jobs. As the project proceeds, it is expected that more jobs will be created by the project.

### *EC2. Wages*

By 2013, Feast Down East had generated \$6.2 million in income to local community members, including the wages paid to employees of the program and self-employed farming income.

### *EC3. Owned/Operated Locally*

Several partners contribute to the operation of the project, including the University of North Carolina Wilmington and the NC Cooperative Extension Service. As a local sustainable agriculture project, stakeholders of the project are community members in southeastern North Carolina, including the farmers that benefit from the services Feast Down East provides. According to the director of the project, the lead organizations are planning to relinquish operation of Feast Down East completely to other local organizations in the future.

### *EC4. Funding*

In 2006, funding from The Golden LEAF Foundation, The North Carolina Tobacco Trust Fund Commission, the Z. Smith Reynolds Foundation, the Appalachian Sustainable Agriculture Project, and Rural Advancement Foundation International supported the establishment of Feast Down East.

### *EC5. Affordable Services*

Feast Down East provides free connections between farmers and consumers. Local farmers who want to participate in Feast Down East can send their products to the distribution center, and from there the products will be sent to consumers regularly. With the help of Feast Down East, local farmers can sell their products more conveniently and at a higher price. At the same time, Feast Down East helps low-income consumers access healthy local foods at affordable prices, using its grant funding.



In addition, Feast Down East holds conferences and provides educational opportunities for local people about food production, nutrition, and economic and environmental impacts of local food production.

#### *EC6. Clustering*

By connecting local farmers to markets, Feast Down East is helping to form a food production industry cluster in southeastern North Carolina. Specifically, it integrates food production, distribution, production planning, and farmer training to create linkages between stakeholders in the industry. According to the definition of the U.S. Department of Agriculture, Feast Down East could be considered a “regional food hub” because through these activities it “... actively manages the aggregation, distribution, and marketing of source-identified local and regional food products primarily from small to mid-sized producers to wholesalers, retailers, and/or institutional buyers (Barham 2011).”

Although Feast Down East does not necessarily attract industries other than agricultural ones, the highly integrated local food network it is supporting can be considered an industry cluster. The director of the program anticipates that this cluster will grow as more farmers and community members become members.

#### *EC7. Tourism*

Feast Down East does not promote tourism directly. However, it encourages tours of farmland by arranging different events, for example, the annual Feast Down East Farm Dinner.

#### *EC8. Cottage Industry*

Feast Down East does not directly encourage home-based businesses.

## *Social*

### *SC1. Entrepreneurship*

Feast Down East encourages entrepreneurship by inspiring younger generations to become farmers and to be involved in the aggregation and distribution process. The project helps young people who have a desire to become small-scale and middle-scale farmers to find land. Moreover, Feast Down East holds conferences to improve farming skills and leadership in younger generations.

### *SC2. Local Culture*

One of the key elements of success for Feast Down East is taking advantage of the small-scale farming heritage in southeastern North Carolina. By holding different conferences and providing help to small-scale farmers, Feast Down East is helping local communities to enhance the culture of farming, as well as healthy life styles.

### *SC3. Rural Character*

With the help of Feast Down East, small-scale farms are becoming more financially viable in rural areas, which may help to maintain the rural character of the region. In addition, more people are becoming familiar with the farming process through the conferences held by Feast Down East. It helps more community members become familiar with, and support, rural lifestyles and landscapes.

### *SC4. Young People*

Feast Down East helps young people willing to become farmers to find land, gain necessary farming skills, and connect them to markets. In this way, it helps to promote inter-generational cooperation by providing opportunities for young farmers to interact and learn from older and more experienced farmers. Young people will have a chance to work together with their parents or other experienced individuals through training and educational events.

#### *SC5. Encourages cooperation among individuals and organizations*

Feast Down East promotes local organizational cooperation by connecting many different partners. Some of these include: research institutions such as University of North Carolina Wilmington, organizations focusing on local agriculture such as Progressive Gardens, local non-profit organizations such as community churches, and foundations such as The Golden LEAF Foundation.

The project also helps local farmers build relationships with businesses and institutions such as grocery stores, schools, restaurants and hospitals. It also helps to connect farmers and other members of their community who purchase their produce.

#### *SC6. Local Institutional Capacity*

Feast Down East is helping local communities build institutional capacity by holding training programs and constructing new distribution centers. At this stage, the project still requires ongoing funding to maintain its daily operations. Primary support comes from Obesity Prevention Grants and Community Transformation Grants from the Centers for Disease Control and Prevention. Although it cannot operate without outside funding and consultation, the director of Feast Down East believes that local communities will have the institutional capacity to run the project by themselves in the near future.

#### *SC7. School Engagement*

Through the Farm-to-Institution Program, Feast Down East helps universities to access local food more easily. It helps young people to form a healthier life style by incorporating local, fresh produce into their diets. For example, University of North Carolina Wilmington (UNCW) Campus Dining is a successful example of how more school food supplies can be sourced (purchased) locally. In the project, Feast Down East partnered with UNCW to make an agreement with the school that some campus dining locations sell only healthy, local food.

In addition, with the help from FoodCorps, a non-governmental organization(NGO) that connects healthy food to children, Feast Down East initiated a Farm-to-School Program “to build school gardens, teach nutrition and gardening in the classroom and increase the availability of fresh local fruits and vegetables in the cafeteria” (Feast Down East 2015).

#### *SC8. Awareness of Social Issues*

Feast Down East does not promote the awareness of social issues directly. However, their service area includes many food deserts, low-income communities and counties with poor health outcomes. By connecting small-scale and middle-scale farms that produce local produce in a sustainable way to consumers in these vulnerable communities, the project may help to raise awareness of obesity, chronic diseases and healthy eating solutions.

#### *SC9. Community Engagement*

Feast Down East promotes community engagement by incorporating community members into the distribution process, encouraging community members to run small-scale and middle-scale farms or purchase healthy locally-grown foods, and inviting community members to educational and networking conferences.

#### *SC10. Faith Community*

Feast Down East engages the faith community to the project by partnering with local churches. For example, Church of Good Shepherd in Wilmington County, North Carolina, is a partner of Feast Down East that helped the program connect with local community members and held regular buyer’s club meetings.

#### *SC11. Life/Job Skills*

Feast Down East helps develop new life/job skills including farming skills, communication skills, and leadership skills. Different conferences are held targeting community members who have different interests. The conferences include Farmer Chef Partnerships Meetings, Education and Awareness Community Events, and Farmer Training Events.

### *SC12. Individual and Community Self-Esteem*

By involving local community members in the distribution process and making small-scale farms more financially viable, the director of Feast Down East believes the program helps farming become more profitable. As the income of farmers increases and more community members are involved in food production, Feast Down East helps farmers to build self-esteem.

### *SC13. Minority Accessibility and Engagement*

The programs of Feast Down East are open to all minority groups. However, the project has not engaged the Hispanic community as much as it would like. The director of Feast Down East said the project was working on involving more minority groups in the project in the future.

## *Environmental*

### *EN1. Vulnerability to Climate Change*

#### *EN1a. Sea Level Rise*

If the trend of global warming continues, some farms that participate in Feast Down East will be inundated by seawater (Barkin 2014). Moreover, saltwater intrusion will have a negative impact on local agriculture (Dixon et al., 2005). Given these circumstances, Feast Down East has moderate exposure, high sensitivity, and low adaptive capacity to sea level rise. Thus, Feast Down East is highly vulnerable to sea level rise.

#### *EN1b. Major Storm Activity*

Extreme weather events will have a strong negative impact on Feast Down East (Riggs et al., 2008). Since the area of Feast Down East is not far from the coast, it is highly exposed to major storm activity. For example, Hurricanes Fran and Floyd hit the area in 1996 and 1999. Feast Down East has high exposure, high sensitivity, and low adaptive capacity to major storm activity. Thus, Feast Down East is highly vulnerable to major storm activity.

### *EN1c. Temperature and Precipitation Patterns*

Agriculture is vulnerable to changing temperature and precipitation patterns (Nelson et al., 2009), but due to the variation of plants and less capital investment, small-scale and middle-scale farms have more adaptive capacity to these changes than large-scale farms (Altieri, 2009). Thus, Feast Down East has high exposure, high sensitivity, and moderate adaptive capacity to temperature and precipitation changes. It is moderately vulnerable to temperature and precipitation changes.

### *EN2. Water Inputs*

Farms can take advantage of economies of scale, meaning that inputs per unit of output will decrease as the scale of farms becomes larger. Some technologies that can help to reduce water inputs on large farms, such as drip irrigation, cannot be used on small-scale and middle-scale farms. Therefore, promoting more small-scale and middle-scale farms will result in higher regional water inputs compared to having fewer large-scale farms cultivating the same area (Speelman et al., 2008). However, Feast Down East has the potential to decrease these water inputs by providing community members with educational opportunities to learn farming techniques that minimize water use.

### *EN3. Energy Inputs*

Feast Down East connects the institutions near the distribution center with local food producers. Therefore, less gasoline will be consumed in the distribution process and the energy required will decrease by shortening the transportation distance for food products. In addition, educational workshops promote the application of more energy efficient farming technologies.

### *EN4. Energy Availability*

According to the director of Feast Down East, the project does not generate energy through food production processes, and it will not increase the energy availability to local community members.

#### *EN5. Food Availability*

Feast Down East increases the food availability to the region by connecting local farmers to regional markets. In addition, by connecting grocery stores to local producers, Feast Down East also increase the accessibility of healthy food for local communities.

#### *EN6. Local Natural Resources*

The project relies on local farmland, water resources, and seafood resources. Supporting small-scale farms that value environmental stewardship and sustainability is the premise for Feast Down East.

#### *EN7. Noise*

Feast Down East has received no complaint about noise so far.

#### *EN8. Air Quality*

By decreasing the need for long-distance transportation for food production, Feast Down East helps to improve regional air quality by decreasing fossil fuel emissions. Moreover, by applying farming skills that are more environmental-friendly, Feast Down East may help to improve the ambient air quality by increasing soil carbon and lowering the usage of pesticides.

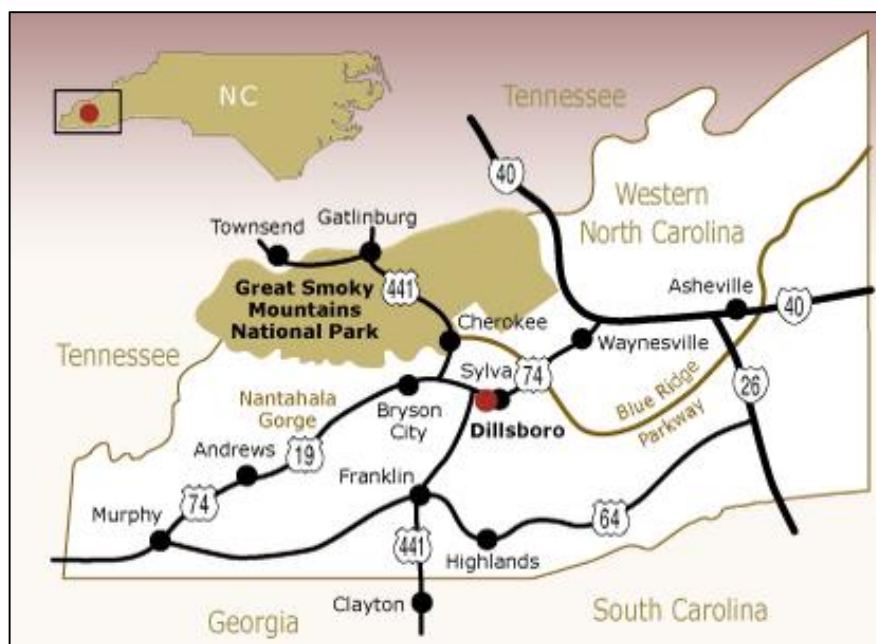
#### *EN9. Water Quality*

Feast Down East helps local people to gain farming skills, such as techniques to minimize fertilizer and pesticide use, and more environmentally-responsible production of livestock. By using these new skills, farmers will release fewer nutrients into adjacent water bodies and contribute less to water quality degradation.

## Jackson County Green Energy Park<sup>5</sup>

The Jackson County Green Energy Park is a renewable energy project in Dillsboro, North Carolina, that encourages the creation of fine artwork and fosters the development of community. The Green Energy Park uses gas emissions from a local landfill and other renewable energy sources to power small businesses and art studios. As a result of its success, it also serves as an ecotourism destination and provides a venue for educating the public about sustainable development efforts. The Green Energy Park is recognized as an EPA Model Project, and it has hosted national and international visitors interested in micro-scale applications of landfill gas.

The Green Energy Park is sited adjacent to the Tuckaseegee River, an important trout fishery and rafting destination, and a significant economic driver for the region (Fig. 15).



**Figure 15.** Location of Jackson County Green Energy Park, Dillsboro, North Carolina (Jackson County Green Energy Park 2015).

<sup>5</sup> The source of information for this section is personal communications with Tim Muth, director of Jackson County Green Energy Park, February 2015, except where other sources are cited explicitly.



The Green Energy Park was constructed from the remains of an abandoned trash transfer facility, located adjacent to the old Dillsboro landfill, which was open from the early 1960's until 1999. This unlined landfill holds approximately 750,000 tons of mostly municipal and household trash (The Jackson County Green Energy Park [JCGEP] 2015).

The original aim of the Green Energy Park was to deal with local environmental issues. Shortly after the landfill's closure in 1999, officials detected high levels of methane and other volatile organic compounds (VOCs) at various subsurface water and gas monitoring wells (Tanaka and Muth, forthcoming). To address the VOC issues and meet established safety parameters for water and air contaminants, Jackson County initiated the construction of a landfill gas extraction system. In addition to addressing environmental issues, the vision of the Green Energy Park also included improving the social and economic situation of the community. The final decision accepted by the Board of Commissioners was to transform the old industrial site into a center for working artisans, utilizing the available landfill gas to power it. Initial cleanup of the 7-acre facility began in 2005, and included the demolition of two buildings, reconstruction of one warehouse using salvaged materials, relocation of a greenhouse facility, and removal of over 550 tons of loose debris.

The Green Energy Park now offers artisans an extensive and growing set of working studio spaces to rent, while providing them with free renewable fuel. This county-owned facility helps encourage successful businesses and brings additional tourists and economic opportunities to the region. The Green Energy Park currently hosts a glassblowing studio, a blacksmithing shop, a glass-shaping shop, a non-ferrous metal foundry, a set of greenhouses, and an outdoor ceramics kiln, all fueled with either landfill gas, waste wood, or waste vegetable oil.

## ***Suitability to Northeastern North Carolina***

### ***Green Sector: Energy Production***

According to the Green Report by Elizabeth City State University's Center for Green Research and Evaluation (Bradshaw 2011), green energy production is one of seven promising sectors that have great potential in the 21 counties of northeastern North Carolina. This includes different types of sustainable energy sources such as solar, wind, geo-thermal, methane capture, and bio-fuel. The Green Energy Park fits into this sector because its primary activity is capturing methane and landfill gas to provide a sustainable energy resource to local residents.

### ***Rural Emphasis***

This project serves mostly Jackson County, which is rural as defined by the Rural Economic Development Center, containing fewer than 250 people per square mile. Additionally, the U.S. Office of Management and Budget lists the county as a rural county (U.S. Census Bureau 2015). According to the U.S. Census Bureau, in 2015 January the total rural population was 29,000, more than 70% of the total population of Jackson County (U.S. Census Bureau 2015).

### ***Northeastern North Carolina Assets***

The Green Energy Park leverages assets similar to those available in northeastern North Carolina (Table 7).

**Table 7.** Assets used in the Green Energy Park project that are also present in northeastern North Carolina.

<b>Human</b>	<b>Cultural</b>	<b>Financial</b>
Skilled workers; non-profit community; educational institutions	Crafting heritage	Tourism; grant opportunities

Tourism and recreation are important economic drivers in western North Carolina,

especially outdoor activities such as fishing and hunting (U.S. Fish and Wildlife Service 2011). The Green Energy Park takes advantage of this tourist presence, attracting visitors that may already be in the region for other activities. For northeastern North Carolina, tourism and recreation are also considered to be important economic drivers for the region. The Albemarle and Pamlico Sounds, Outer Banks coastal region, and the Roanoke River are just a few of the places people come to visit.

Grant opportunities are also an important asset supporting Jackson County Green Energy's successful operation. Without funding from organizations such as the Golden LEAF Foundation and The Conservation Fund, the project would not be possible. In the case of northeastern North Carolina, similar funding is also available. Most grants supporting the Jackson County Green Energy Park are also available for our research area. Possible grant opportunities can be found from the North Carolina Rural Center, North Carolina Community Development Initiative, Environmental Defense Fund, Albemarle-Pamlico National Estuary Program, and the Albemarle-Pamlico Conservation and Communities Collaborative. Federal funds are also available to both of these places, including grants from the United States Department of Agriculture Rural Enterprise. For example, in July 2014, the Obama administration launched a \$10 billion rural infrastructure fund that it hopes will jump-start investments in a wide range of projects in rural communities (U.S. Department of Agriculture 2014). Target investments will include community assets, including housing, healthcare and educational projects, rural water and wastewater systems, rural energy projects, broadband expansion efforts, local and regional food systems, and other infrastructure.

In addition to financial support, the nonprofit community and educational institutions also represent important human assets that the Green Energy Park relies on. In particular, Western Carolina University, The Conservation Fund and the North Carolina Rural Center have been working closely with the Jackson County Green Energy Park to provide technical and outreach support.

Finally, the Green Energy Park also leverages the strong tradition of craft in Jackson County.

The large number of artists in the area reflects this local artistic culture. The high number of skilled workers that specialize in crafting makes it possible for the Green Energy Park to attract renters and earn a consistent income. In addition, strong traditions of crafts play an important role in providing public support and participation for activities and services provided by the Green Energy Park.

Based on the three criteria outlined above, the Jackson County Green Energy Park is clearly suitable for northeastern North Carolina. The program fits in to the energy production sector as defined by Elizabeth City State University's Green Report, it focuses its services on rural populations, and it leverages assets currently present in northeastern North Carolina. In the next section, we will describe how this project achieves the objectives of the Triple Bottom Line approach.

### ***Assessment of Objectives***

#### *Economic*

##### *EC1. Jobs*

This project itself does not directly create jobs. However, the Green Energy Park provides support for tenants in the park's workspace, and these tenants are local community members. In this indirect way, the Green Energy Park has provided 15 full-time jobs for local artisans. They either work for a metalworker or help to teach classes to the community. Additionally, the facilities of the Green Energy Park make it possible for local people to have part-time jobs engaging in artisan work or educating the public about sustainability. The Green Energy Park has created 20 part-time jobs so far, but expects to create more than 40 after the construction of a craft center complex in 2016.

##### *EC2. Wages*

The Green Energy Park provides a living wage to the 15 full-time artisans at the park by enabling them to rent workshops for craftwork and to teach classes to the public, both activities that provide significant income.

For the part-time jobs, the income is supplementary and not enough to be considered a living wage. Most of the part-time workers have other jobs, for example, as middle school teachers and local artists. Especially for some of the public classes, the part-time workers are volunteers who receive no income from their work at the Green Energy Park.

#### *EC3. Owned/Operated Locally*

The Green Energy Park is owned and operated by Jackson County. The Green Energy Park receives some funding and technical support from other local and national organizations, but Jackson County maintains control over the whole project.

#### *EC4. Funding*

Jackson County provided \$1.4 million for the project, over 80% of the total (JCGEP 2015). Other funding sources are NC State Energy, United States Department of Agriculture Rural Enterprise, the North Carolina Rural Center, the Appalachian Regional Commission, the Golden Leaf Foundation, Handmade in America, and the Resourceful Communities Program (JCGEP 2015). This represents a mix of funding from local, state, and federal government and non-profit organizations.

#### *EC5. Affordable Services*

The Green Energy Park provides classes and other educational opportunities to visitors. It accommodates visits from schools, organizational staff, governmental officials, travelers, and researchers. The Green Energy Park has presented 36 open-access artisan educational classes since the year of 2007, attracting more than 300 participants and focusing on topics like blacksmithing and Cherokee metalworking (JCGEP 2015).

Other than educational services, the Green Energy Park also provides recreational services. The project is open to the public for recreation and since 2007, the Green Energy Park has hosted an annual art festival with free admission. In 2011, more than one thousand visitors came to see 30 contributing artists who demonstrated their crafts and provided interactive experiences for youth (JCGEP 2015).

### *EC6. Clustering*

By supporting the work of local artisans, The Green Energy Park is part of a growing cluster of handmade crafting businesses and organizations in western North Carolina. HandMade in America, a leading non-profit organization in this cluster, reports that the annual economic impact of the professional craft industry in this region amounted to \$206.5 million in 2007 (Stoddard et al., 2008).

There are no other clean energy projects similar to Green Energy Park in the region. However, there are several hundred currently used and closed landfills in the state of North Carolina, each with the potential to produce the kind of sustainable energy that the Green Energy Park provides (NC Department of Environment and Natural Resources 2015). The Green Energy Park does not offer financial or technical support to other areas interested in replicating the project, but it can still be used as a model. By educating the public and other interested parties about energy-producing methane capture with hands-on demonstrations and informational talks, the park can act as an inspiration for others in the region to create similar facilities. In this way, the capability of the Green Energy Park to cluster with other renewable energy projects can be seen as limited so far, but possible in the future.

### *EC7. Tourism*

Each year, the park attracts visitors from all over the world. Engineers, politicians, Brazilian artists, and tourists from Mexico, Ukraine, Venezuela, and India have all come to see the Green Energy Park. According to the park, about 800 to 1,000 people come to visit each year and this number is growing (JCGEP 2015). Most visitors from outside the state or Country will stay a day or more in Jackson County to visit the park and other places in the region. During this time, they use the county's goods and services, boosting the local economy.

### *EC8. Cottage Industry*

The Green Energy Park supports businesses for local artisans, who often engage in home-based businesses. In this way, it encourages a cottage industry by making it financially

viable for community members to engage in crafting and other small manufacturing from their homes.

## *Social*

### *SC1. Entrepreneurism*

The Green Energy Park encourages the entrepreneurial spirit of local businesses, especially green energy businesses. It encourages the success of new artisans in the area by holding skill development workshops and providing accommodation and workspace. The Green Energy Park creates a community space that makes it possible for local entrepreneurs to communicate, share ideas, and cooperate.

Green entrepreneurship can start by using the Green Energy Park as a source of inspiration. Its success encourages entrepreneurs engaging in similar green or sustainable projects to continue with their work. The Green Energy Park exemplifies the way that entrepreneurship can be linked to green or sustainable business.

### *SC2. Local Culture*

The Green Energy Park is strongly connected to local and regional culture. Most notably, it emphasizes western North Carolina's great tradition of artisans skilled in producing various crafts and music.

### *SC3. Rural Character*

By emphasizing handmade tradition and greenhouse agriculture, the Green Energy Park exemplifies rural character.

### *SC4. Young People*

The Green Energy Park gives special consideration to youth. First, the park offers youth-specific blacksmith classes through funding from the Appalachian Regional Commission. Second, there are many tours arranged for local high schools and universities. Third, at the annual art festival, all participating artists must demonstrate their crafts and/or provide a

hands-on experience for children. At one festival, children built a mosaic tile wall and painted large murals together. That work is still on display at the park, and school groups often come back and point out the work that they did.

The Green Energy Park encourages intergenerational cooperation of artisans by providing the chance for community members of all ages to work together. At the studios in the Green Energy Park, artisans from different generations are welcomed to work together and learn from each other. The classes are another activity that helps foster intergenerational cooperation between learners and professionals.

#### *SC5. Cooperation*

The Green Energy Park itself is a program resulting from organizational cooperation. Jackson County has sought help and support from several organizations, including North Carolina State Energy, United States Department of Agriculture Rural Enterprise, North Carolina Rural Center, Appalachian Regional Commission, Golden Leaf Foundation, the Conservation Fund, Handmade in America and the Resourceful Communities Program. These organizations still cooperate through regular meetings with the project director.

In addition, the Green Energy Park cooperates with government agencies and colleges, providing affordable facilities. Jackson County Grounds Department and Southern Western Community College cultivate plants in the Green Energy Park for landscaping, saving them more than \$10,000 each year (JCGEP 2015).

#### *SC6. Local Institutional Capacity*

Jackson County has complete control over the Green Energy Park and since the beginning of the project it has shown consistent and effective leadership. The continuing success of the project confirms that the county has the necessary institutional capacity to maintain the Green Energy Park.



### *SC7. School Engagement*

The Green Energy Park engages schools with regular tours and classes and cooperates with local universities. In addition, Western Carolina University and Southwestern Community College offer a for-credit glassblowing class through the park.

### *SC8. Awareness of Social Issues*

The Green Energy Park educates the public about social issues such as sustainable energy development and environmental responsibility. By publicizing methane capture for energy use through tours and materials on their website (<http://www.jcgep.org/>), visitors are made aware of global climate change issues and sustainable energy development.

### *SC9. Community Engagement*

The Green Energy Park engages the community actively through artisan participation, public classes and the annual art festival. From the popularity of art class series and art festivals, along with the artisan active activities, we can conclude that the Green Energy Park engages the local community in a very enthusiastic way.

### *SC10. Faith Community*

The Green Energy Park does not specifically engage communities of faith through its activities.

### *SC11. Life/Job Skills*

The Green Energy Park teaches local people new life and job skills through artisan and blacksmith classes that are open to the public. Even the tours can be very helpful to provide awareness of artisan crafts, but the classes can be even more useful for mastering these skills.

### *SC12. Individual and Community Self-Esteem*

The Green Energy Park is a positive environment to help to build individual and community self-esteem and self-worth. It emphasizes aspects of rural character and a self-

sufficient culture, encouraging local residents to embrace these aspects of their identity and community. According to the Appalachian Regional Ministry, the region's people are "self-reliant, independent, hard-working, stable, and [have] strong ties to family" (Appalachian Regional Ministry 2015). Self-sufficient activities like crafting and agriculture exemplify these characteristics. In addition, the income and services offered to the community through the park bring a sense of recognition and pride.

The success of the Green Energy Park also provides a positive image of the role of sustainable development in rural North Carolina and the United States.

### *SC13. Minority Accessibility*

The Green Energy Park offers a friendly environment that is open and accessible to the public, including minority communities. However, there has been no focused effort to engage minority communities.

## *Environmental*

### *EN1. Changing Environmental Conditions*

#### *EN1a. Sea level Rise*

The Green Energy Park has hardly any exposure to sea level rise or saltwater intrusion because it is located far west and away from the coast. Without any exposure, the project itself is not sensitive to sea level rise and needs no adaptive capacity for dealing with it. However, energy production from the park reduces 222 tons of methane annually, offsetting 550 tons of CO<sub>2</sub> from entering the atmosphere, which helps to mitigate global climate change and subsequent sea level rise (Tanaka and Muth, forthcoming). However, there is no evidence to prove this effect at a small scale, and it is reasonable to say that sea level rise barely has any effect on the project.

### *EN1b. Major Storm Activity*

The project has little exposure to storm activity problems. The major activities of the Green Energy Park are not reliant on any particular weather. Events may be affected or canceled during storms, but the effect is minor since these events can be postponed until better weather. It is reasonable to conclude that the project has a low sensitivity to storm activity changes in the future. Thus, considering the existing evidence of the Green Energy Park, it is valid to say that changes in major storm activity will not affect this project.

### *EN1c. Temperature and Precipitation Patterns*

No evidence has shown that the Green Energy Park has exposure to temperature and precipitation change. With no exposure, the project is not sensitive to changing temperature and precipitation patterns and does not need adaptive capacity for dealing with them. Local temperature and precipitation changes do not have any proven influence on the routine operations of the park, including landfill gas capture, artisan work or greenhouse agriculture. For tourism, the same effects from major storm activity apply to temperature and precipitation change: they may have some influence on a case-by-case basis, but generally there is no significant impact.

### *EN2. Water Inputs*

The Green Energy Park consumes water for studios and greenhouses. The studios use water as cooling fluid for hot metalwork and the greenhouses use water for agriculture. In addition, the greenhouses have a simple solar heating system that uses 40 fifty-five-gallon drums of water (JCGEP 2012). The park directors do not record water usage and there are no mechanisms to reduce or re-use water. Thus, it is reasonable to deduce that the Green Energy Park consumes as much water as a conventional studio and greenhouse space.

### *EN3. Energy Inputs*

The studios use energy produced from landfill gas to power forges and foundry work while the greenhouses use energy produced from simple solar heaters to power boilers. The

park is self-sustaining, producing enough energy from landfill gas capture and simple solar sources to power all of its activities without relying on energy inputs.

#### *EN4. Energy Availability*

The very purpose of the Green Energy Park is to increase the availability of energy in the region. There are 13 gas extraction wells working in the 9-acre landfill with an average gas flow of 40 cubic feet per minute. This amount of energy produces 1.2 million btu/hour and goes towards powering the greenhouses and artisan studios (JCGEP 2012).

#### *EN5. Food Availability*

The Green Energy Park does not increase food availability and does not plan on doing so in the future.

#### *EN6. Local Natural Resources*

The Green Energy Park does not rely on local natural resources. The methane-capture system that produces energy is a substitute for more conventional methods of energy production such as natural gas and coal-fired power plants, which use a substantial amount of natural resources. The crafting materials and seeds used by the studios and greenhouses are not locally produced (JCGEP 2015).

#### *EN7. Noise*

According to the director of the Green Energy Park, there have not been any noise complaints about the operation or construction of the Green Energy. Since the park is located away from major residential and commercial areas and the activities there do not produce constant or unbearable noise, the project does not affect the tranquility of rural places.

#### *EN8. Air Quality*

Improving the air quality is one of the reasons that Jackson County decided to build the Green Energy Park and it has been successful. Almost all landfills generate both methane

and a liquid leachate as a by-product of decomposition and through infiltration of surface water. These chemicals can pollute the air with not only unpleasant smells but also health hazards.

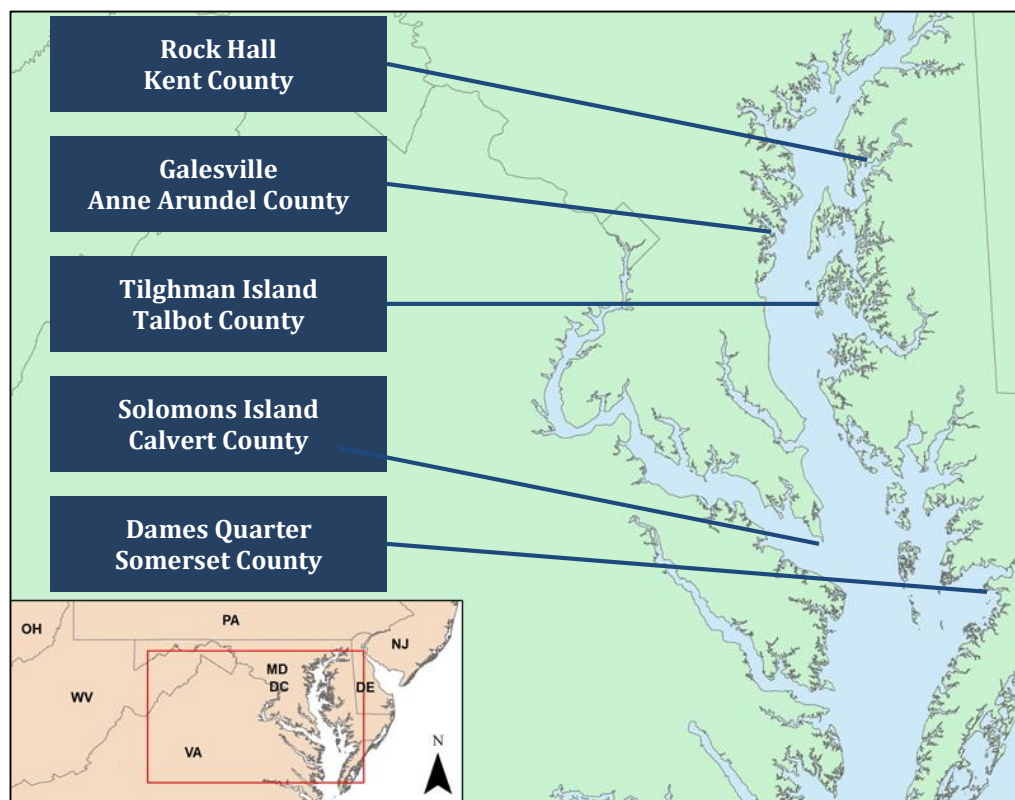
According to a report produced by Western Carolina University in 2014, the landfill gas and leachate volatile organic compounds contributed to health hazards for the public before construction of the Green Energy Park (Tanaka and Muth, forthcoming). However, after completing the landfill gas capture system at the park, more than one million pounds of trash and debris were removed from the site. Monitoring data revealed that gas and leachate collection and removal efforts had measurable and positive effects on reducing the level of pollutants migrating from a landfill (Tanaka and Muth, forthcoming). This certainly proves that the Green Energy Park significantly improves local air quality.

#### *EN9. Water Quality*

The landfill gas and liquid leachate produced can be a threat to water quality. Considering the fact that the landfill is close to the Tuckaseegee River, this threat caused enough concern and attention to warrant monitoring of water quality before and after the building of the Green Energy Park. According to the report produced by Western Carolina University in 2014, soil contamination, which represents a threat to water quality, was significantly reduced for 40% of all monitoring sites after the efforts of the Green Energy Park (Tanaka and Muth, forthcoming).

## Watermen Heritage Tours<sup>6</sup>

The Chesapeake Bay (Fig. 16) has a rich tradition of men and women engaged in fishing, crabbing, oystering, and clamming to make a living. However, the number of these individuals, traditionally referred to as watermen, is steadily decreasing in response to depleted fishery stocks, competition from imported seafood, and pressures from coastal development (Dewar et al. 2009). In 2008, the blue crab population hit historic lows, prompting the governors of Maryland and Virginia to request relief funding from Congress to help buoy the commercial fishing industry. Soon after, the Department of Commerce designated \$15 million to aid commercial fishing in the name of this “national disaster” (Harper 2010).



**Figure 16.** Map of Chesapeake Bay and Watermen Heritage Tourism Training Program workshops.

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<sup>6</sup> The source of information for this section comes from personal communications with Joanna Ogburn, Director of Programs, and Joel Dunn, Executive Director, The Chesapeake Conservancy, February 2015, except where other sources are cited explicitly.

With a portion of that money, a group of four Chesapeake Bay area non-profit organizations<sup>7</sup> designed an innovative training program to provide Maryland watermen with skills to develop tours associated with Chesapeake Bay maritime heritage. Their efforts resulted in the Waterman's Heritage Tourism Training Program, a series of five identical workshops held in different locations throughout the state of Maryland (Fig. 17), targeted towards any watermen from the region willing to participate. The purpose of the program was to enable watermen to supplement their diminishing fishing income with profits from heritage tours related to their craft and help them to preserve their way of life.

Graduates of the training program received certification and assistance in creating their own businesses. In addition, any graduate could choose to be featured on the Watermen Heritage Tours website. Users can find contact information for these tour guides, descriptions of various tour activities, and a brief history of the program and Chesapeake Bay fishing. In 2014, more than 5,700 unique visitors accessed the website, available here: <http://www.watermenheritagetours.org>.

Following the completion of the trainings in 2012, the programs leaders began a second phase of the program called Watermen Heritage Tours (WHT) that remains active today. WHT offers on-going assistance to tour guides through networking, advertising activities, and the continuing maintenance of the website. More training workshops are planned for the future, the next scheduled for March 2015 (Dean 2015).

Several organizations have noted the success of WHT for providing opportunities to supplement watermen's income with heritage tourism. For example, the Maryland Historical Trust presented the lead non-profit, the Chesapeake Conservancy, with the 2013 Maryland Preservation Partnership Award. In addition, regional media published over 10 articles covering the activities and popularity of WHT among tourists and watermen guides.

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<sup>7</sup> Chesapeake Conservancy, Coastal Heritage Alliance, Maryland Watermen's Association, and Chesapeake Bay Maritime Museum

Organizations in Virginia even replicated the program in their part of the Chesapeake Bay, training over 20 watermen by the end of 2014 (Jasinski et al. 2014).

The program takes advantage of an iconic maritime heritage, which is present in both the Chesapeake Bay and coastal North Carolina. Specifically, the centerpiece of the WHT program is the commercial fishing industry, which has a very high cultural value in the state of Maryland. It is notable that a waterman is featured on the Maryland state seal and the oyster dredging-ship called the skipjack is the official state boat. Without this cultural asset, it is difficult to imagine many regional tourists would be interested in participating in heritage tours related to commercial fishing.

Although the number of watermen is decreasing every year, there are still roughly 6,000 licensed commercial fishermen in Maryland (Wiest 2014). These men and women represent a crucial human asset that makes maritime heritage tourism possible. Participants of the WHT tours expect to see and hear the stories, knowledge, and fishing skills of Maryland watermen, which would be impossible to replicate without authentic commercial fishermen.

The proximity of the Chesapeake Bay, especially the eastern half, to populous urban centers is an important physical asset that has contributed to the early success of WHT. Many of the tourists who participate in watermen heritage tours come from Washington D.C., Baltimore, and Annapolis on day or weekend trips that do not require a plane flight or long car ride. Wiest (2014) emphasizes this point, contrasting one successful tour guide that lives closer to urban centers with a less successful tour guide who lives “far off the beaten bath” and who is not “getting the calls.”

Finally, WHT relies on an open water body and harvestable populations of seafood, two important environmental assets. The Chesapeake Bay and its tributaries cover about 11,700 square miles (EPA 2013) and, although low compared to historic counts, the total commercial catch of all species for Maryland in 2013 was nearly 44 million pounds (NOAA 2015). These two assets are necessary for WHT because nearly all the tours currently



offered are water-based and many involve harvesting seafood, most notably fish, crab, oysters, or clams.

### ***Suitability to Northeastern North Carolina***

#### ***Green Sector: Heritage Tourism***

According to Elizabeth City State University's Green Report, heritage tourism is a sector that markets the "unique history [of an area] to draw new tourism dollars to the region" (Bradshaw 2011). Although not a business, Watermen Heritage Tours clearly facilitates the creation of businesses in this sector. The program provides training and support to market the regional maritime culture of the Chesapeake Bay and bring in tourists from surrounding areas.

Waterman guides trained by WHT are now offering a wide range of tours to the public, each of which feature some unique aspect of maritime and watermen heritage. As an example, one captain offers a "skipjack sail," which is a ride on a traditional fishing boat used specifically in the Chesapeake Bay for oyster dredging. Another captain takes passengers oystering in a different way, with manually operated oyster tongs. As he put it to one tourist, "What I'm doing now you could do 100 years ago" (Dell 'Amore 2013).

#### ***Rural Emphasis***

The original Waterman's Heritage Tourism Training Program held workshops in five counties. Of these five, three are rural as defined by the Rural Economic Development Center, containing less than 250 people per square mile: Kent, Talbot, and Somerset. Between the other two, Calvert County contains 594.8 people per square mile and Anne Arundel County contains 1,295.9 people per square mile according to the most recently available data (U.S. Census Bureau 2010). It is also important to remember that participants from outside these counties were welcome to attend the workshops free of charge, if they provide their own transportation.

The current facilitation phase of the WHT program continues to serve these original five counties, but also offers its services to the entire Maryland portion of the Chesapeake Bay.

On its website, the WHT breaks this area into five wide swaths that each encompass primarily rural counties. Of the 13 total counties that sit adjacent to the Chesapeake Bay, nine of them fall below 250 people per square mile threshold for qualifying as rural (U.S. Census Bureau 2010).

#### *Northeastern North Carolina Assets*

WHT leverages similar cultural, human, physical, and environmental assets to those available in northeastern North Carolina (Table 8).

**Table 8.** Assets used in Watermen Heritage Tour program that are also present in northeastern North Carolina

<b>Cultural</b>	<b>Human</b>	<b>Physical</b>	<b>Environmental</b>
Maritime heritage	Skilled labor (commercial fishermen); non-profit community; educational institutions	Proximity to urban centers; tourism infrastructure	Open water body; harvestable stocks of marine life

North Carolina assigns both cultural and economic value to the commercial fishing industry, just as Maryland does. Public support for working waterfronts, places where fishermen traditionally offload their catch and prepare it for transport, persuaded state officials to create a special committee to investigate ways to protect it from other types of development (National Working Waterfront Network 2015). In 2011, there were 3,244 commercially licensed fishermen in North Carolina, representing a valuable human asset available to the region. In the same year, the commercial fishing industry contributed an estimated \$248 million to the state economy (NC Rural Economic Development Center 2013).

The Albemarle and Pamlico Sounds, which are home to more than 720 marine species, provide 39 harvestable fish stocks to state fishermen (Hanbury 2012). These water bodies, as well as coastal areas adjacent to the Atlantic Ocean, are accessible to many urban

populations from North Carolina (e.g., Raleigh, Charlotte) and out of state (e.g., Richmond, Virginia; Washington, D.C.). It is estimated that approximately 5 million visitors go to the Outer Banks each year (Galloway and Scott 2015).

Leaders in northeastern North Carolina understand the potential for heritage tourism in the region. In 2012, a group of North Carolina tourism organizations collaborated to prepare a report supporting designation of eastern North Carolina as a National Heritage Area, which would provide economic and political advantages (Carlino 2012). The region even has a website that compiles and advertises heritage tourist destinations, allowing businesses to update their own information (NC Northeast Commission 2015). Eco-tourism, a related industry, is also established in northeastern North Carolina, most notably the network of riverside campsites and outfitters associated with a paddle trail established by the Roanoke River Partners (Roanoke River Partners 2015).

Based on the three criteria outlined above, the WHT program is clearly suitable for northeastern North Carolina. The program fits into the heritage tourism sector as defined by Elizabeth City State University's Green Report (Bradshaw 2011), it focuses its services on rural populations, and it leverages assets currently present in northeastern North Carolina. In the next section, we will describe how WHT achieves the objectives of the Triple Bottom Line approach.

## ***Assessment of Objectives***

### *Economic*

#### *EC1. Jobs*

The original training workshops and the current WHT program do not create jobs directly. Instead, the program is intended to help watermen develop knowledge and skills to start their own heritage tourism businesses. In this way, WHT enables watermen to retain their day-to-day fishing jobs, which might otherwise be lost due to insufficient income. By the end of the 2014 season, a total of 48 watermen offered a heritage tour of some kind.

Many of the new heritage tourism businesses provide jobs to family members or crew. According to one program director, some watermen do not feel comfortable with the oral presentation aspect of a tour, leaving that duty to their spouse or crewmember. However, these jobs are intermittent and available only when a tour is booked.

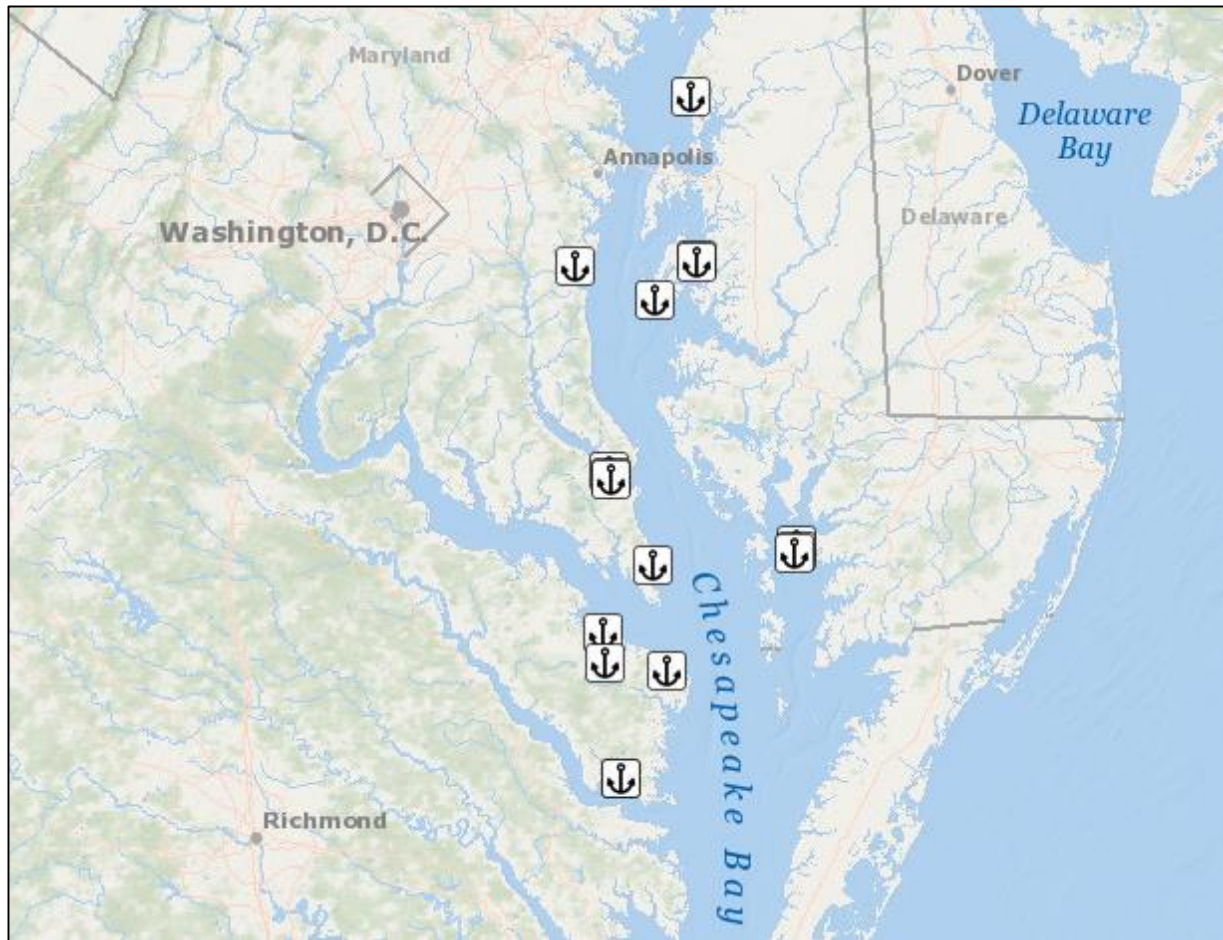
### *EC2. Wages*

According to the WHT website, “the training isn’t meant to take the watermen off the water, but to give them skills they can use to supplement their incomes with a related new business” (Watermen Heritage Tours [WHT] 2015). Only one waterman out of the 48 who are actively engaged in running heritage tours has stopped fishing completely in favor of a tourism business, suggesting that the industry does not typically provide a living wage. However, this could also indicate that watermen are reluctant to stop fishing completely.

Detailed information about the direct financial impact that heritage tours have on watermen is not tracked. Despite this, there is some indication that tours are having some positive effect. Between the first and second seasons following the initial training workshops in 2013, the number of tours booked increased by 76%. Additionally, several watermen have reported anecdotal success with their businesses. One reported that when he does not have to invest in advertising, marketing, or accounting, the money from tours “can add up to significant income” (Weist 2014).

### *EC3. Owned/Operated Locally*

Local watermen in the Chesapeake Bay region own and operate all of the businesses started as a result of the WHT program. WHT provides advertising and networking support, but provides no financial investment or significant business consulting. The WHT website currently shows 17 different heritage tour opportunities on a map of the Chesapeake Bay region (Fig. 17), which represents the watermen who requested to be featured on that page.



**Figure 17.** Locations of Waterman Heritage Tour businesses according to the program website (WHT 2015).

#### *EC4. Funding*

Both the original training workshops and current WHT business services were funded by a grant from the Maryland Department of Natural Resources. This money was a portion of the \$15 million that was given to Maryland and Virginia by the Department of Commerce in 2008 to help the commercial fishing industry. A mix of public funds and foundation grants will support future trainings and the continuation of business services.

#### *EC5. Affordable Services*

It is completely free to attend a training workshop or to access the marketing and networking services offered by the WHT program. Costs for transportation to events and

startup costs associated with a heritage tourism business, however, are left to the individual watermen.

#### *EC6. Clustering*

WHT is already outside the Maryland portion of the Chesapeake Bay into the Northern Neck of Virginia. A group of Virginia non-profit organizations replicated the training workshops and certified 20 Virginia watermen as heritage tour guides. Just as the Maryland watermen, they are free to have their contact information on the WHT website for the public to access. All of the businesses benefit from the wide-reaching marketing campaigns implemented by the program's non-profit leadership, in which each business is considered a piece of the larger community of watermen heritage tours. Some tour guides are reluctant to group themselves with all of the other watermen tour guides, however, because they want to maintain a "local stamp."

#### *EC7. Tourism*

WHT businesses are drawing many tourists from urban centers like Philadelphia, southern New Jersey, Washington, D.C., and Baltimore. Some watermen guides have incorporated their tours into package tours offered by larger operators. These are more appealing for tourists coming from longer distances. The watermen tours have also captured a lot of business from relatives of locals who are coming into town for a family event.

#### *EC8. Cottage Industry*

The tours offered by WHT businesses are nearly all conducted on the water, not in the home. Additionally, the tours offer an experiential and cultural service, as opposed to a manufactured product. For these reasons, WHT businesses cannot be considered a part of a cottage industry.

## *Social*

### *SC1. Entrepreneurism*

The WHT program encourages an entrepreneurial spirit because it is the watermen who have to create and maintain their own business using the new knowledge and skills they have. Parts of the training curriculum cover basic business concepts like developing a plan, securing investment, and navigating regulations, but the watermen have to then put that into practice. Indeed, after interviewing several watermen about their heritage tourism businesses, researcher Mark Wiest (2014) found that a willingness to take an entrepreneurial approach was a key characteristic of the most successful businesses.

### *SC2. Local Culture*

The primary goal of the WHT program is to provide watermen with skills to market their unique livelihood as commercial fishermen. The Chesapeake Conservancy, the coordinator of the program, writes that the tours each waterman learns how to conduct are “associated with Maryland’s history, environment, and maritime heritage...” (WHT 2015). Tour participants see and experience a lifestyle that has defined the Chesapeake Bay region for hundreds of years. Specific activities on each tour are left up to the individual guides, but currently available tours relate to fishing, crabbing, and oyster harvesting with traditional gear, sunset sailing, and historic place sightseeing.

### *SC3. Rural Character*

Jason Gray, formerly of the North Carolina Rural Economic Development Center, describes rural character as having an “emotional and financial tie to the land or water in a way that is profound,” and feeling a “deep connection to a place...even if it is not the primary source of income” (Gray 2014). The WHT reinforces and encourages a rural character by providing watermen with another means, aside from commercial fishing, to stay engaged with and present on the water. Mark Wiest (2014) describes one tour guide who told him that “the days of the traditional watermen are numbered” and that “exposing people to the sights, smells, tastes, and feel of life on the water” only helps to protect his future working

the water. In this way, the WHT program both helps watermen stay engaged in a rural occupation and exposes outsiders to the rural lifestyle.

#### *SC4. Young People*

Taking children on water-based tours can be difficult because of liability concerns, especially on commercial fishing boats. However, tour operators still try to engage youth by offering land-based tours that highlight off-the-water aspects of commercial fishing such as crab processing and oyster shucking. Many of these kinds of tours end in seafood feasts by the water, which is appropriate for all ages. Some operators also offer “dockside demonstrations” during which watermen stay on the boat and perform normal ship duties while children can still see and experience the activity from the dock.

A major concern for the commercial fishing industry is the lack of young watermen entering the trade. Conversion of waterfront (fish house) properties to residential development, increasing regulations, and pressure from foreign imports make it difficult to support a family solely through wages earned from commercial fishing. However, the emergence of heritage tourism as a form of supplemental income could incentivize young and entrepreneurial watermen to pursue water-based industries. Glenn Mark, the coordinator of the Virginia WHT program, reflected on the fact that his “father is a retired commercial fishermen [and sees] this program as a way for our watermen to continue to make a living out on the Chesapeake and its tributaries...” (Robins 2014). If it can draw young people to the trade, there is a good chance for inter-generation cooperation because “most watermen [begin] working with fathers, uncles, or cousins” (Wiest 2014).

#### *SC5. Cooperation*

A group of four non-profits, each with unique perspectives and goals, facilitated the original training workshops: The Chesapeake Conservancy, Coastal Heritage Alliance, Maryland Watermen’s Association, and Chesapeake Bay Maritime Museum. Additionally, “local watermen’s associations and state officials supported the program and helped to recruit participants” (Wiest 2014).



Several heritage tour businesses are partnering with other local businesses to increase their exposure and capture existing tourism traffic. In particular, watermen are connecting with restaurants, bed and breakfasts, and museums. WHT is trying to encourage this kind of networking by holding events during which local establishments can connect with watermen tour guides. The next training workshop, scheduled for March 2015, will feature a panel of bed and breakfast owners, land-based tour operators, and restaurateurs who will talk about partnership opportunities.

Chesapeake Bay watermen often conflict with government officials and environmentalists over regulations and other issues. WHT helps to ease these tensions by offering watermen opportunities to build positive relationships with the government and environmental communities through collaborative activities. For example, the first WHT tour operators faced laws preventing them from harvesting at commercial limits if they had even a single tourist on board, making it unreasonable to consider leading less lucrative tours. WHT and the Department of Natural Resources worked together to change the law beginning in Spring 2014.

#### *SC6. Local Institutional Capacity*

The Chesapeake Conservancy devoted significant staff time and resources to coordinating the training workshops and providing ongoing business services to watermen. Even after the original federal funding was exhausted, the Chesapeake Conservancy and Coastal Heritage Alliance continued to search out new sources of funding (Wiest 2014). Still today, The Chesapeake Conservancy dedicates a program coordinator to manage the WHT program and coordinate future activities.

#### *SC7. School Engagement*

Some community colleges in the region are using WHT operators to add experiential components to their courses. For example, Goucher College in Baltimore, MD, offers a cultural preservation course that takes students out on a waterman heritage tour.

Among the watermen, at least one tour operator offers to give presentations in classrooms about net making and other topics related to the commercial fishing industry.

#### *SC8. Awareness of Social Issues*

Leading tours on the water in commercial fishing vessels provides a platform for watermen to discuss important issues they face, including government regulations, fish stock populations, and poor water quality. For example, one waterman said he used his interactions with the public “to discuss the challenges that face managers and watermen alike when it comes to predicting stock abundance” (Wiest 2014). Customers walk away from tours with exposure to socioeconomic and political issues they might not have known about before.

#### *SC9. Community Engagement*

The WHT program focuses on engaging the Chesapeake Bay watermen community in the Maryland area with its services. Program coordinators have built relationships with respected members of this group in order to build trust and gain access to other individuals that might be unresponsive otherwise.

Outside of this specific community, WHT guides have reported that many customers are local community members who sign up when family members or friends come to town for a separate event. Some guides have also engaged with local schools, as reported in sub-objective SC8.

#### *SC10. Faith Community*

The WHT program makes no effort to engage the faith community with its activities.

#### *SC11. Life/Job Skills*

The workshops were meant to leave participants with a comprehensive suite of knowledge and skills to create and lead successful heritage tours on the Chesapeake Bay. According to

the Chesapeake Conservancy, the lead coordinator of the program, participants learned about the following:

...thematic tour development, historic and cultural community asset identification, storytelling and cultural interpretation, Chesapeake Bay maritime history, state and county tourism agencies, the Capt. John Smith Trail, business plan development, US Coast Guard regulations, vessel insurance, Maryland DNR regulations, and potential funding sources for new business ventures (WHT 2015).

#### *SC12. Individual and Community Self-Esteem*

Despite watermen's iconic status in Maryland culture, recent disagreements with government officials and environmentalists over regulations and ecological studies have troubled the community with negative stereotypes of lawlessness and inflexibility. Understanding this, many WHT guides find that leading tours provides an opportunity to improve their public image. It allows them to "voice our side" and show that watermen are not "museum pieces" (Wiest 2014). Mike Vlahovich, director of the Coastal Heritage Alliance, says "...every time they tell their own story, it becomes more important to them and they hopefully pass it on to other generations" (Lutz 2013).

#### *SC13. Minority Accessibility*

The training workshops and business services are open to all members of the public free of charge, however, there is some concern that WHT has failed to reach the African American community. To address this, in March 2015, WHT will conduct a workshop in Dorchester County, MD, an area that is home to a significant population of African American watermen.

## *Environmental*

### *EN1. Changing Environmental Conditions*

#### *EN1a. Sea Level Rise*

Most tours occur on the water surface and do not face significant problem from sea level rise or saltwater intrusion. However, the coastal communities in which most watermen live face severe threats from sea level rise, especially in the Chesapeake Bay (Boesch et al. 2013). If watermen were forced to retreat or re-locate, this could negatively impact their business and even force them to shut down. Both the communities and the businesses in them are typically low income and without access to major sources of financial resources. Given these circumstances, we can say that WHT has high exposure, moderate sensitivity, and low adaptive capacity to sea level rise, making this project highly vulnerable to sea level rise.

#### *EN1b. Major Storm Activity*

Similar to traditional commercial fishing, heritage tour operators only operate during fair weather. Even moderate storms prevent watermen from heading out to sea; this means that an increase in major storm activity would have a negative effect on tour operators only if it increased the total frequency of storms of any severity. However, extremely severe storms can have repercussions beyond the days on which they are active. Storm-related damage to coastal infrastructure can drastically reduce tourism (Bin et al. 2007) and destruction of private property can reduce profitability and force businesses to close (Repetto 2012). It is unknown how major storm activity will change in the Chesapeake Bay, but the decreased tourism and destruction of property that may occur make water-based businesses sensitive to increased levels. As a result, this project is moderately vulnerable to major storm activity.

#### *EN1c. Temperature and Precipitation Patterns*

Watermen regularly deal with day-to-day inconsistencies in weather. Regional and longer-term climate patterns are not as important to the waterman as the daily weather of the Chesapeake Bay. However, just as for sub-objective EN1b, if temperature and precipitation

patterns changed so drastically as to decrease tourism traffic and increase the number of days they could not go to sea, then this would have a negative impact on the profitability of watermen tours. Until more data is available, we may consider this project to have a low vulnerability to changing temperature and precipitation patterns.

#### *EN2. Water Inputs*

There are no significant water inputs associated with the WHT program or the tours that WHT operators lead.

#### *EN3. Energy Inputs*

There are very few energy inputs associated with the WHT program or the tours that WHT operators lead, except for gasoline. Heritage tour on a commercial vessel involves similar activities to normal fishing operations and there have been no reports of an increase in fuel consumption as a result of running tours.

#### *EN4. Energy Availability*

The WHT program does not increase energy availability for community members in any way.

#### *EN5. Food Availability*

The WHT program does not increase food availability for community members. However, some tour guides have mentioned that they discuss the benefits of locally caught seafood in comparison to imported seafood.

#### *EN6. Natural Resource Use*

Most heritage tours rely on the waters of the Chesapeake Bay to provide an exciting and picturesque setting in which to take customers. Many also incorporate harvesting some type of seafood such as crabs, oysters, or fish to provide the main course of a dockside feast, or simply for the experience. Watermen, whether leading a tour or not, follow strict catch limits that are in place to maintain healthy and viable fish populations.

#### *EN7. Noise*

Most of the mechanical activity that would create significant noise happens away from land, typically out of earshot.

#### *EN8. Air Quality*

Air quality impacts as a result of watermen heritage tours are no different from those already generated by commercial fishing.

#### *EN9. Water Quality*

Water quality impacts as a result of watermen heritage tours are no different from those already generated by commercial fishing. Most water quality issues in the Chesapeake Bay relate to nutrient and sediment inputs from agricultural runoff, as well as stormwater discharge from coastal development (Copeland 2012). As reported in sub-objective SC9, watermen discuss these issues with customers during tours.

## Final Performance Matrices for Case Studies

The following tables (Tables 9, 10, 11) compare the performance of the previous three case studies for each sub-objective in the assessment tool. Tables 3, 4, and 5 (see previous section) list the description and criteria for each sub-objective. In general, the symbol “√” means the project performs exceptionally well for the sub-objective, the symbol “--” means the project performs moderately for the sub-objective, and the symbol “×” means the project performs poorly for the sub-objective.

**Table 9.** Performance matrix for case studies: economic sub-objectives.

Economic Sub-Objective	Feast Down East	Jackson County Energy Park	Watermen Heritage Tours
Jobs	73 (Full-time)	15 (Full-time)+ 20(Part-time)	Didn’t create jobs directly
Wages	Yes	Yes (Full-time); No (Part-time)	Didn’t provide wages directly
Owned/Operated locally	√	√	√
Funding	√	√	√
Affordable services	√	√	√
Clustering	--	--	√
Tourism	×	--	√
Cottage industry	√	--	×

**Table 10.** Performance matrix for case studies: social sub-objectives.

Social Sub-Objective	Feast Down East	Jackson County Energy Park	Watermen Heritage Tours
Entrepreneurism	√	√	√
Local culture/heritage	√	√	√
Rural character	√	√	√
Young people	√	√	--
Cooperation	√	√	√
Local institutional capacity	×	--	√

School engagement	√	√	--
Social issues	×	√	√
Public engagement	√	√	√
Faith community	√	×	×
Life/Job skills	√	--	√
Self-esteem	√	√	√
Minority accessibility/engagement	--	--	--

**Table 11.** Performance matrix for case studies: environmental sub-objectives.

Environmental Sub-Objective	Feast Down East	Jackson County Energy Park	Watermen Heritage Tours
Sea level rise	×	√	×
Major storm activity	×	√	--
Temperature and precipitation patterns	--	√	√
Water inputs	--	×	√
Energy inputs	√	√	√
Energy availability	--	√	--
Food availability	√	--	--
Local natural resources	×	√	--
Noise	√	√	√
Air quality	√	√	--
Water quality	√	√	--



## Discussion

Our project presents three products that communities can use to pursue sustainable development projects in their region. First, we developed a broad-based inventory and web-map of community assets from the 21 counties of northeastern North Carolina. Second, we compiled a small database of existing sustainable development projects that use similar assets to those identified in the inventory. Third, we created an assessment tool that is useful for characterizing the strengths and weaknesses of those and other projects. These results confirm that there are existing sustainable development projects which are suitable for northeastern North Carolina and adhere to The Conservation Fund's Triple Bottom Line approach.

The inventory of assets showcases the diverse and abundant resources that exist in and around northeastern North Carolina communities. Acknowledging these assets is the first step towards developing a place-based and sustainable regional economy that leverages internal strengths. Presenting the inventory as a web map enables community members to spot connections and linkages between resources in different locales. The inventory includes assets from all 21 counties in northeastern North Carolina, in contrast to other asset inventories in North Carolina that have smaller scales such as the Outer Banks coast (Saltwater Connections 2010), or look at one category of assets, such as tourism and heritage sites (NC Northeast Commission 2015). Another unique aspect of our web map is the 1-meter sea level rise scenario that is available for visualization next to asset markers. With this, users can quickly see where assets and potential projects are exposed to this threat. Currently, there is no mechanism for allowing users to update the map with markers of their own. However, staff of The Conservation Fund will have the necessary access to edit the map if users contact them with suggestions or they wish to make their own edits.

Still, recognizing how different assets might complement each other can be difficult. The database presented here can help to inspire creativity by highlighting how other communities have used their own assets for sustainable development projects. Other

compilations of case studies have been completed for this region (Lambe 2006) or rural areas (Burr 1995), but these are out of date and did not select cases based on how appropriate they are for northeastern North Carolina as we have done here.

The assessment tool is the most interactive of the three products, offering a means to compare existing and potential sustainable development projects. With 35 unique assessment objectives, it enables users to examine a project in a systematic and comprehensive way to determine if that project would be an appropriate fit for their community. If a community ever attempts to replicate that project, they can use the tool as an organizational framework to propose changes to specific aspects of the design. For example, use of the assessment tool revealed that none of the three case studies presented in this project made a concerted effort to reach minority communities. If minority outreach was important to a community hoping to replicate one of these projects, they could make sure to add a new component to the existing model that would address this deficiency.

Although our assessment tool is not the first attempt to use multi-criteria analysis as a decision-support tool for sustainable development projects, our tool and our suggested process of using the tool for local communities are more suitable to our research goal than other multi-criteria analysis. First of all, in most of studies applying multi-criteria analysis, objectives were determined at the beginning and cannot be changed (Dodgson et al., 2009; Mateo, 2012). Our study provides instructions for local community members on finding their own critical issues by identifying sub-objectives specific to their communities. If they want to use our assessment for finding sustainable development opportunities in the future, they can survey the members in their communities as well as academic professionals. For example, the impacts of sea level rise may be important to coastal counties, but the issue may not be critical to inland counties. Thus, different communities can use different sub-objectives in our assessment tool.

Moreover, the primary goal of our assessment tool is not providing a quantitative comparison among potential options, but providing a way for all stakeholders to find key information. Published examples include multi-criteria analysis of sustainable development

in manufacturing and transportation (Omann 2004), rural energy infrastructure (Cherni 2010; Russi 2007), and rural telecommunication networks (Lee et al. 2001). In those studies, sub-objectives and criteria were specific to a sector, often quantitative and highly complex. In contrast, our assessment tool is aimed to provide a systematic but simple way to present key information about potential projects to stakeholders. A complex quantitative result may not be understandable to most local community members and may be extremely costly and time-consuming to produce. By providing detailed information as well as a final performance matrix, our tool provides an opportunity for all of the local community members to understand the results and discuss their own future in community meetings.

Like many other published studies, we incorporate vulnerability to climate change into our multi-criteria analysis assessment tool. These other studies show that multi-criteria analysis is a useful tool to evaluate the impacts of climate change in decision-making processes. For example, Wang et al. (2009) evaluated the impacts of climate change in the design of energy systems. Greening and Bernow (2004) incorporated the response to climate change into their evaluation of environmental policies. Konidari and Mavrakis (2007) used multi-criteria analysis to evaluate climate mitigation policy instruments. In our study, we use an accepted vulnerability framework that incorporates exposure, sensitivity and adaptive capacity to climate threats (Southwest Climate Change Network 2015). These concepts help communities think about the relationship between climate change and sustainable development and complement the sea level rise visualization provided on our web map.

Each of the three components in this project, the inventory of assets, database of case studies, and multi-criteria assessment framework, is grounded in some form of stakeholder input. This is crucial because extensive research shows that stakeholder participation improves decision-making outcomes in various ways. Omann (2004) presents an overview of these benefits, included among them: providing relevant questions to society (Spangenberg 2003); decision are seen as “legitimate” (Rasuchmayer 2000); and the process of participation enhances civic and social competence and improves political skills

(Webler et al. 1995). The inventory of assets began with community asset-mapping exercises and was completed with either stakeholder-produced documents or research conducted in collaboration with people in the region. The assets, in turn, limit the types of projects included in the database of sustainable development projects. Finally, the assessment tool sub-objectives are based on surveys completed by community members, as well as the same stakeholder-based materials used to compile the inventory of assets.

We cannot assume, however, that the assets and objectives outlined by the inventory and assessment tool represent the ideas and attitudes of all stakeholders in northeastern North Carolina. The data we received from the original asset map and our own surveys was representative of only those individuals connected to the network of our client, The Conservation Fund. It is possible that some community members disagree with or find little value in many of the objectives and assets we documented. Extensive and independent research in the study area would be necessary to ensure that our tools take as many community voices into consideration as possible.

It is also important to recognize that our work, especially the online web map and database, will be inaccessible to some members of the community. Technology is a wonderful way to store and publish research, but the necessary skills to operate the computer, Internet, and web applications may be too specialized to make it truly public. We will need to work closely with The Conservation Fund to create helpful documentation and provide alternative means to making the inventory, database, and assessment tool available.

## Conclusion

Taken together, the inventory of assets, database of case studies, and assessment tool form a suite of products that communities in northeastern North Carolina can use to pursue place-based sustainable development in their region. They complement existing studies and provide an aid to implementing some of their recommendations. For example, the Economic Development Strategic Plan of Martin County, a community in northeastern North Carolina, encourages that community to pursue a multifaceted approach to development that includes “small business development, entrepreneurship, existing business sport, and... tourism” (Sanford Holshouser 2011). The products created by this project can help to inspire, design, and refine these and other kinds of sustainable development projects.

Local leaders and researchers should continue to encourage communities in northeastern North Carolina to identify assets in their region. Saltwater Connections, a collaboration of community members and researchers that craft local heritage projects in the Outer Banks, NC, is one organization that is already doing this. Beginning in 2010, the group set up a website that allows users to place markers on web maps that represent local economic, social, and political assets in their community (Saltwater Connections 2015). Regional tourism boards have a similar website, tailored to heritage and environmental sites and businesses in northeastern North Carolina (NC Northeast Commission 2015). However, it might be useful to consolidate these asset maps into a single web interface where users can access information about assets in one location.

Maintaining an up-to-date database of existing sustainable development projects in northeastern North Carolina, as opposed to outside the region as we did for our database of case studies, is another possible opportunity going forward. We chose to select case studies from outside of the study area because there was more readily available information about them, but as new sustainable development projects emerge in northeastern North Carolina, it would be a good idea to track and highlight them as a more local source of inspiration in the region.

Sustainable development is a promising solution to addressing issues related to poverty and vulnerability to the affects of climate change. Elements necessary to achieving this kind of development, such as functioning infrastructure, business expertise, and adequate funding, may be lacking in certain regions. As a result, communities need information and tools to help them decide how to make the most out of existing resources. Identifying their assets, looking to outside successes, and examining projects using a Triple Bottom Line framework are three useful ways that communities can fill this need and think creatively about sustainable development.

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# **Appendix A**

## **Consent Script for Participation in Research**

You are volunteering to participate in a research project conducted by Yufei Li, Colin Stief, and Weinan Zheng, graduate students enrolled in the Nicholas School of the Environment at Duke University. We are conducting this research in partnership with The Conservation Fund, a national non-profit organization focused on environmental preservation and economic development.

This study is designed to gather information about the suitability of sustainable development opportunities for Northeastern North Carolina. These opportunities were selected for their ability to (1) provide economic opportunity for the region and (2) increase a community's resilience to climate change.

Your participation in this project is voluntary and you may withdraw at any time. The following interview will last between 30-60 minutes, and will be audio recorded in order to clarify written notes. The recording will be stored at Duke University in a password-protected file for 5 years, and will not be available outside of this research team. You may decline to be recorded, or decline to answer any of the questions we pose without reason.

In the final publication of this study, we will not identify you by name, although we may refer to your job title and geographic location in order to give some context for your responses.

## Appendix B

### Survey for Capturing Community Interests for Economic Development

Thank you for taking the time to participate in this survey, which is designed to capture what you believe to be most important for community economic development projects in Northeast North Carolina. We are a group of three graduate students at Duke's Nicholas School of the Environment working on a client-based "Master's Project" in coordination with staff of The Conservation Fund's Resourceful Communities Program. Our goal is to create an assessment tool that local community leaders can use to evaluate potential community economic development projects in this region.

In particular, we are interested in projects that use multiple sources of funding and expertise from a wide variety of public, private, and non-profit partners to provide environmentally sustainable economic opportunities. A great example is the Roanoke River Paddle Trail in Northeast North Carolina, which includes a network of river camping sites and provides infrastructure for small businesses like guides and outfitters to succeed (<http://www.roanokeriverpartners.org/Default.aspx>).

The Jackson County Green Energy Park in western North Carolina is another good example. The park has a system to capture methane gas from a local landfill to provide free energy for several artisan studios, greenhouses, and other businesses (<http://www.jcgep.org/>). It also rents out studio space to the public and hosts a series of classes and community events.

You may be familiar with The Conservation Fund's Triple Bottom Line approach that focuses on (1) economic, (2) social, (3) and environmental factors, and how these areas of community development work together to impact community change and growth. The goal of this survey is to characterize potential economic development projects based on certain factors that fit into the three categories identified above. We need your help determining which factors are most important to consider when assessing community economic development projects. The following table lists some examples of each factor:

Economic	Social	Environmental
Number of jobs created or sustained for community members by the project directly or by businesses supported by the project	Number of skill development opportunities for community members as a result of the project	Potential pollutants created by project activities, such as carbon dioxide or toxic contaminants
Typical wage for community members provided by jobs created or sustained	Degree to which the project is characteristic of local culture, such as rural values, agricultural traditions, or fishermen heritage	Annual electricity use by community as a result of project activities
Availability of funding from private and public sources to support and sustain the project	Accessibility by minority communities to benefit from services and opportunities created by the project	Ability to react to and endure various climate scenarios and natural disasters



Your experience with your community in the region where we are focusing our research is valuable and will help to create a more comprehensive assessment tool that incorporates additional factors that you think are important.

The survey should take about 15-30 minutes to complete. The information we collect will be kept with our research team and only be used in the formation of our assessment tool and final report. We will not use names in any documentation of our findings, and will only refer to a respondent's geographic location and type of work environment (e.g., government, non-profit, private sector).

Please submit your responses by December 20, 2014.

\*\*\* If you would like to conduct this survey over the phone, please contact a member of our research team at one of the email addresses provided below. \*\*\*

Thank you again for your time and help completing this survey.

Yufei Li (yufei.li@duke.edu)  
Colin Stief (colin.stief@duke.edu)  
Weinan Zheng (weinan.zheng@duke.edu)

## **Economic Factors**

*Examples of economic factors include but are not limited to: Number of jobs created or sustained for community members by the project directly or by businesses supported by the project; Availability of funding from private and public sources to support and sustain the project*

1a. Please list *economic* factors you think are important to rural economic development in your community and in the northeastern region of NC

1b. Of the factors you listed in the previous question, please rank them in order of importance from most to least.

## **Social Factors**

*Examples of social factors include, but are not limited to: Degree to which the project is characteristic of local culture, such as rural values, agricultural traditions or fishermen heritage; Accessibility by minority communities to benefit from services and opportunities created by the project.*

2a. Please list *social* factors you think are important to rural economic development in your community and in the northeastern region of NC

2b. Of the factors you listed in the previous question, please rank them in order of importance from most to least.

### **Environmental Factors**

*Examples of environmental factors include, but are not limited to: Potential pollutants created by project activities, such as carbon dioxide or toxic contaminants; Ability to react to and endure various climate scenarios and natural disasters.*

3a. Please list *environmental* factors you think are important to rural economic development in your community and in the northeastern region of NC

3b. Of the factors you listed in the previous question, please rank them in order of importance from most to least.

### **Priority**

4. Given 100 points, how would you distribute them among the three categories (economic, social, environmental)? You may include specific factors that you listed above in each category, if you wish.

Example: 50 points to economic, 25 points to environmental, 25 points to social factors.

### **Personal Information**

5. Which of the following best describes your place of work?

Non-governmental Organization  
University or Research Institution  
Local government  
Local Industry  
Others\_\_\_\_\_

6. What city or county do you work in primarily?

7. How long have you worked in this region?

Thank you very much for your time!

## Appendix C

### Sources for Sub-Objectives in Multi-Criteria Analysis Assessment Tool

Community Asset Maps facilitated by The Conservation Fund / Resourceful Communities Program	Available upon request <sup>8</sup>
Conetoe Family Life Center Presentation	<a href="http://www.nciom.org/wp-content/uploads/2013/01/Richard_Joyner_RHTF_051413.pdf">http://www.nciom.org/wp-content/uploads/2013/01/Richard Joyner RHTF_051413.pdf</a>
Conservation Fund / Resourceful Communities Program	Personal communication with Mikki Sager, director, Resourceful Communities Program, April 2014
Focus groups of people involved in NC commercial fishing industry facilitated by NC Catch	Available upon request <sup>9</sup>
Growing Local/Buying Local video documentary	<a href="http://communityvoicemethod.org/growinglocal/">http://communityvoicemethod.org/growinglocal/</a>
Interview	Personal Communication, Jason Gray, former director of Research and Innovation at the NC Rural Economic Development Center, December 2015
Public Listening Sessions: Sea Level Rise and Population Growth in North Carolina	<a href="http://www.cakex.org/sites/default/files/Public%20Listening%20Sessions%20in%20North%20Carolina.pdf">http://www.cakex.org/sites/default/files/Public%20Listening%20Sessions%20in%20North%20Carolina.pdf</a>
Your Place in the New Economy: Speaker Panel and Community Listening Session	<a href="http://www.ecsu.edu/urm/headline.cfm?ID=11342">http://www.ecsu.edu/urm/headline.cfm?ID=11342</a>

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<sup>8</sup> Contact the author at w.zheng1991@gmail.com.

<sup>9</sup> Contact the author at colin.stief@gmail.com